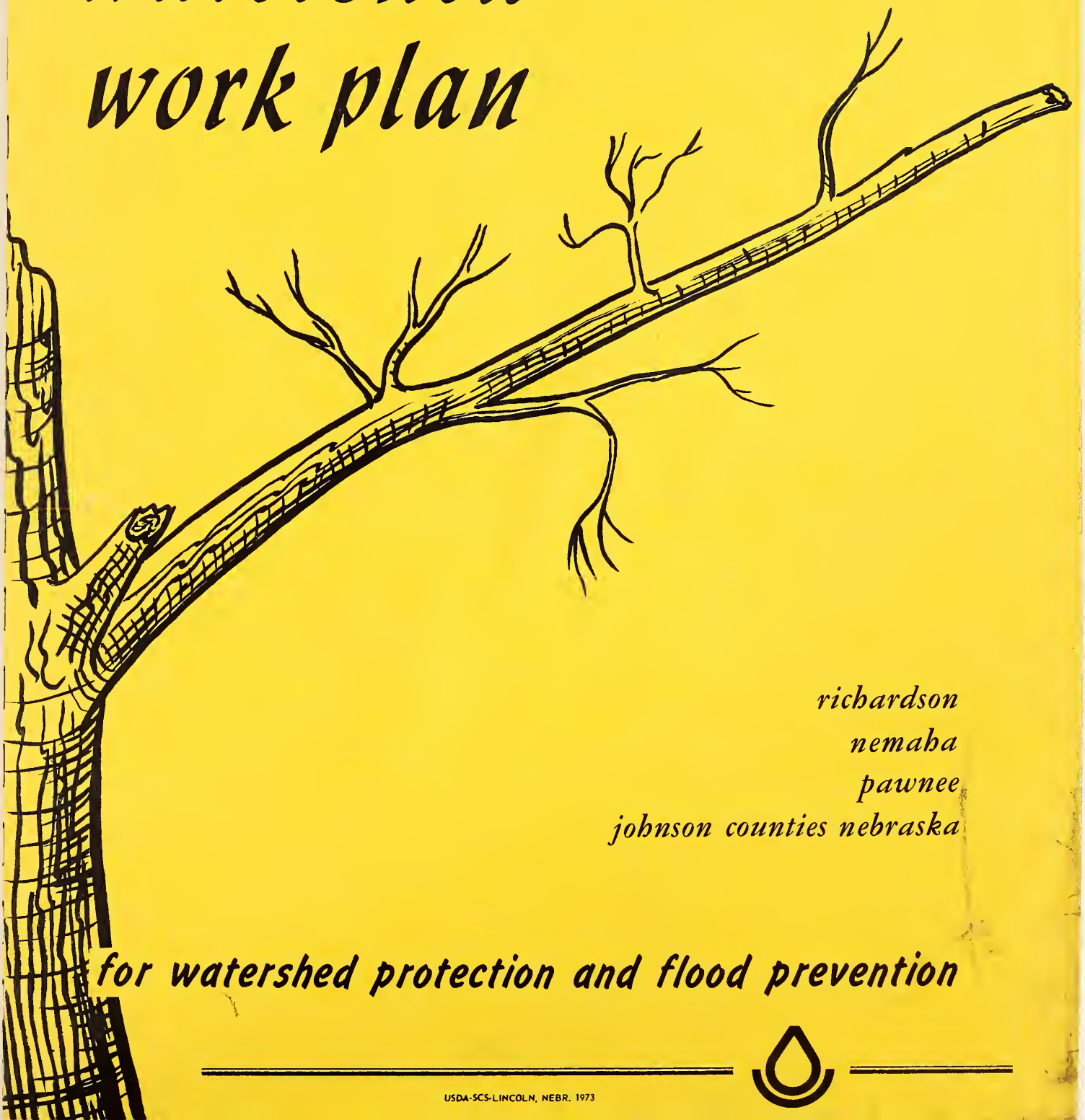
long branch watershed work plan



richardson
nemaha
pawnee
johnson counties nebraska

for watershed protection and flood prevention

USDA-SCS-LINCOLN, NEBR. 1973

ADDENDUM,

WATERSHED WORK PLAN AGREEMENT,

and

WATERSHED WORK PLAN

LONG BRANCH WATERSHED

Nemaha, Pawnee, Richardson, and Johnson Counties, Nebraska

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act. (Public Law 566, 83d Congress, 68 Stat. 666) as amended.

PREPARED BY:

Nemaha Natural Resources District
Box 717
Tecumseh, Nebraska 68450

With Assistance by:

U. S. Department of Agriculture, Soil Conservation Service
State of Nebraska, Natural Resources Commission
U. S. Department of Agriculture, Forest Service
State of Nebraska, Office of the State Forester

April 1976

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ADDENDUM

Long Branch Watershed, Nebraska

This addendum is in response to the intent of established Principles and Standards for planning water and related land resources which became effective October 25, 1973.

It consists of three parts as follows:

I. Plan Evaluation Using Current Costs

II. Selected Plan Effects Display

III. Abbreviated Environmental Quality Plan

PART I

Plan Evaluation Using Current Costs

Long Branch Watershed, Nebraska

Project costs in this Addendum are based on 1975 price base for installation costs amortized for 50 years at 6-1/8 percent interest.

Benefits are based on current normalized prices (Water Resources Council - October 1974) for agricultural commodities and current prices for other items.

Annual project benefits, costs, and benefit-cost ratio are as follows: benefits, $340,950; costs, $169,830; and benefit-cost ratio, 2.0:1.0.

Annual project benefits, costs, and benefit-cost ratio, excluding secondary benefits, are as follows: benefits, $320,280; costs, $169,830; and benefit-cost ratio, 1.9:1.0.

PART II

Selected Plan Effects Display

Long Branch Watershed, Nebraska

The following tables summarize effects of the selected plan in terms of National Economic Development, Environmental Quality, Regional Development, and Social Well Being. These four accounts are consistent with concepts set forth in Principles and Standards.

Selected Plan

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects (Avg. Ann. Dollars)
Beneficial Effects:	
A. The value to users of increased outputs of goods and services.	
1. Flood Prevention	$209,430
2. Grade Stabilization	43,750
3. Recreation	56,700
4. Redevelopment	10,090
Total Beneficial Effects	$319,970

Components	Measures of Effects (Avg. Ann. Dollars)
Adverse Effects:	
A. The value of resources required for a plan.	
1. Floodwater Retarding Structures, Multipurpose Reservoir, Grade Stabilization Structures, and Recreation Facilities	
Project Installation 1/ (structural measures)	$136,120
Project Administration 1/	17,050
OM&R	11,240
Total Adverse Effects	$164,410
Net Beneficial Effects	$155,560

1/ Amortized for 50 years at 5-7/8 percent interest.

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Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects
Beneficial and adverse effects:	
A. Areas of natural beauty.	1. Create about 426 surface acres of water.
	2. Reduce the average annual flooding on about 1,000 acres, thus reducing the potential for the development of mosquito breeding areas on these acres.
	3. Creation of 69 acres of wildlife habitat vegetation which will improve the aesthetic quality of the area.
	4. About 97 acres of woodland will be destroyed by installation of structural measures.
	5. Improve the visual environment of the watershed with the application of land treatment measures, wildlife habitat development, and an overall reduction in the erosion process.
B. Quality considerations of water, land and air resources.	1. Reduce gully erosion from critical sediment source areas to the mouth of the watershed by 78 percent or from 34,500 to 7,500 tons per year.
	2. Reduce sediment delivery to main channels of Long Branch from all erosion sources by 51 percent or 107,600 tons per year. Reduce sediment delivery to the mouth of the watershed and the Nemaha River from all erosion sources by 51 percent or 69,900 tons per year.
	3. Reduce sediment and scour monetary damages to 187 acres of flood plain land by 84 percent.

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Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects
B. Quality considerations of water, land and air resources. (continued)	4. Reduce floodwater damages by 65 percent to crops and pasture, by 65 percent to other agriculture, and by 67 percent to fences, buildings, roads, and bridges.
	5. Apply land treatment measures on about 7,800 acres of dry cropland and about 3,070 acres of pastureland during the project period; thus reducing the soil loss on these areas from sheet and rill erosion to the maximum allowable of 5.0 tons/acre/year or less.
	6. Reduce the deficiency of recreational land in the Beatrice Socioeconomic area by providing public access to 459 acres of water - land based recreational facilities.
	7. Improve woodlands with forestry treatment measures and increased fire protection.
	8. Reduce flood damages on 2,570 acres of flood plain resulting in higher personal incomes to families who are direct beneficiaries of flood control measures.
	9. Reduce turbidity and nutrient loads to lower portion of Long Branch and the Nemaha River thus improving quality of water.
C. Biological resources and selected ecosystems.	1. Create about 426 acres of water that will enhance fisheries and other aquatic life and also serve as resting and feeding areas for waterfowl.
	2. Create at least 69 acres of high quality wildlife habitat.

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Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects
C. Biological resources and selected ecosystems. (continued)	3. Improve fish and aquatic life by prolonged channel flows from structure release.
	4. Accelerate land treatment which will benefit and improve the overall ecosystem.
	5. Eliminate about 219 acres of varying quality wildlife habitat.
	6. Permanently inundate about 20.5 miles of ephemeral, 1.3 miles of intermittent, and 2.3 miles of perennial stream channel.
	7. Periodically inundate about 13 miles of ephemeral and 1.1 miles of perennial channel.
	8. Improve water quality in lower reaches of Long Branch and the Nemaha River by reduction of sediment yields and other pollutants.
D. Irreversible or irretrievable commitments.	1. Agricultural production will be lost on approximately 377 acres due to installation of the structural measures.
	2. Agricultural production will be reduced temporarily (1 season) on about 15 acres because of disturbances created by construction equipment activity during installation of structural measures.
	3. The normal routine of one farm family will be temporarily disrupted while the farmstead is relocated.

Selected Plan

ENVIRONMENTAL QUALITY ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects
D. Irreversible or irretrievable commitments. (continued)	4. Agricultural production will be reduced on about 486 acres because of occasional inundation by flood pools. This includes 39 acres of woodland, 106 acres of woody pastureland, 95 acres of open pasture, and 246 acres of cropland.

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Selected Plan

REGIONAL DEVELOPMENT ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects (Avg.Ann. Dollars) Nebr. Planning and Development Region 7	Rest of Nation
A. Income:		
Beneficial effects:		
1. The value of increased output of goods and services to users residing in the region.		
a. Flood prevention	$209,430	-
b. Grade stabilization	43,750	-
c. Recreation	56,700	-
d. Redevelopment	10,090	-
e. Secondary	20,670	-
Total Beneficial Effects	$340,640	

Components	Measures of Effects (Avg.Ann.Dollars) Nebr. Planning and Development Region 7	Rest of Nation
A. Income:		
Adverse effects:		
1. The value of resources contributed from within the region to achieve the outputs.		
a. Floodwater Retarding Structures, Multipurpose Reservoir, Grade Stabilization Structures, and Recreational Facilities		
Project Installation 1/ (structural measures)	$ 26,290	$109,830
Project Administration 1/	580	16,470
OM&R	11,240	-
Total Adverse Effects	$ 38,110	$126,300
Net Beneficial Effects	$302,530	$-126,300

1/ Amortized for 50 years at 5-7/8 percent interest.

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Selected Plan

REGIONAL DEVELOPMENT ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects: Nebr. Planning and Development Region 7	Measures of Effects: Rest of Nation
B. Employment		
Beneficial effects:		
1. Increase in the number and type of jobs		
a. Agricultural employment	Utilization of 40 man-years of employment in agricultural production	-
b. Employment in recreation service sector	2 permanent seasonal semiskilled jobs	-
c. Employment for project construction	45 semiskilled jobs for 1 year	-
d. Employment for project OM&R	1 permanent semiskilled job	-
Total Beneficial Effects	41 permament semiskilled jobs	-
	2 permanent seasonal semiskilled jobs	-
	45 semiskilled jobs for 1 year	-

Components	Measures of Effects: Nebr. Planning and Development Region 7	Measures of Effects: Rest of Nation
B. Employment		
Adverse effects:		
1. Decrease in number and types of jobs		
a. Loss in agricultural employment of project take area	4 man-years of agricultural employment	-
Total Adverse Effects	4 permanent semiskilled jobs	
Net Beneficial Effects	37 permanent semiskilled jobs	-
	2 permanent seasonal semiskilled jobs	-
	45 semiskilled jobs for 1 year	-

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Selected Plan

REGIONAL DEVELOPMENT ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects: Nebraska Planning and Development Region 7	Rest of Nation
C. Population Distribution		
Beneficial Effects	Creates 45 semiskilled jobs for 1 year and 1 permanent semiskilled job in a rural area which has experienced a 36 percent reduction in population in the four county area during the period of 1940 to 1970. Creates 40 permanent semiskilled jobs and 2 permanent seasonal semiskilled jobs.	-
Adverse Effects	-	-
D. Regional Economic Base and Stability		
Beneficial Effects	Provide flood protection to a 2,570 acre flood plain in an area where 56 percent of the families have incomes of $4,000 or less. Creates 45 semiskilled jobs for 1 year and 1 permanent semiskilled job.	-

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Selected Plan

SOCIAL WELL-BEING ACCOUNT

Long Branch Watershed, Nebraska

Components	Measures of Effects
Beneficial and Adverse Effects:	
A. Real income distribution	1. Create 37 low to medium income permanent jobs for area residents.
	2. Create regional income benefit distribution of $340,640 by income class as follows:

Income Class (dollars)	Percentage of Adjusted Gross Income in Class	Percentage Benefits in Class
Under 5,000	34	12
5,000-12,000	48	46
Over 12,000	18	42

3. Local costs to be borne by regional total $38,110 with distribution by income class as follows:

Income Class (dollars)	Percentage of Adjusted Gross Income in Class	Percentage Benefits in Class
Under 5,000	34	12
5,000-12,000	48	46
Over 12,000	18	42

B. Life, health and safety	1. Provide 100-year level of flood protection to city of Humboldt.
	2. Provide gully erosion control at 12 locations, thus reducing hazardous conditions to men and equipment farming these areas.
	3. Provide 67 percent reduction in flooding to roads and bridges at 20 locations.
	4. Provide a 65 percent reduction in average annual flood damages.
C. Recreational opportunities	1. Create 25,200 annual recreation visits primarily for local, rural, and small town residents.

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PART III

Abbreviated Environmental Quality Plan

Long Branch Watershed, Nebraska

Environmental Problems

Land and Water Quality: Soils in the watershed are deep, fertile, and moderately to highly productive. These soils are highly susceptible to sheet and gully erosion with a resultant loss in crop production, increased farming operational costs, and a downgrading of water quality from delivery of sediment to the stream channels.

About 15,700 acres of cropland and about 3,070 acres of pastureland are presently exceeding the 5 tons/acre/year tolerable soil loss. About 4,000 acres are experiencing severe soil losses, losses in production, and increased farming operational costs due to the presence of unstable grades.

Total gross erosion in the watershed approximates 582,300 tons/year, 373,000 tons/year from sheet erosion and 209,300 tons/year from gully erosion. Under present conditions annual soil losses on untreated cropland range from 7 tons/acre/year on 0 - 3 percent slopes to 19 tons/acre/year on 3 - 9 percent slopes. An average yield from untreated cropland sheet erosion approximates 14 tons/acre/year. Soil losses from untreated pastureland on average slopes of 10 - 15 percent range from less than 5 to 7 tons/acre/year.

Gully, streambank, and channel erosion are active in the watershed. Gully erosion contributes 36 percent or 209,300 tons/year of the total gross erosion yield and is categorized within the following elements:

Critical source areas	49,300 tons/year
Main channel bank erosion	15,000 tons/year
Remaining tributary areas	145,000 tons/year

Approximately 212,000 tons of sediment, 89,500 tons from sheet and 122,500 tons from gully and streambank erosion, are deposited annually within the channel and flood plain boundaries below planned structural measures. Approximately 65 percent (137,800 tons) of this sediment yield reaches the mouth of the watershed or the Nemaha River. Quantities of sediment delivered to major streams reduce stream capacity and are harmful to stream fishery resources. This sediment also reduces water quality and contributes to a general degrading of the environment because insecticides, herbicides, heavy chemicals, and phosphates from fertilizers used in agricultural production adhere to or are adsorbed by sediment particles. Nitrogen is also carried in runoff sediment, particularly in organic form and as adsorbed ammonium on clay particles.

Most sediment movement occurs during major storm events. This sediment is transported by water and deposited into ponds and the stream system.

Biological Resources: Competition for land uses has resulted in wildlife habitat losses. It is anticipated that woodland will be reduced about 100 acres due to increased land utilization and area conversion to pastureland. Uncontrolled grazing, poor stand composition, and low timber quality are major forestry problems.

Grazing and sheltering is common in many of the stands with resulting soil compaction and loss of liter and humus. All these conditions lend themselves to an overall deterioration of stands for wildlife habitat and an increase in sediment yields with a resultant decrease in water quality and deterioration of fish or aquatic habitat.

Bodies of water within the watershed are limited to small surface area ponds constructed for livestock water. Migrating waterfowl and other varieties of wildlife attracted to water bodies find little use of the watershed. Limited bodies of water provide little opportunity for the development of fish habitat. Additional ponds and lakes would increase fish habitat, reduce sediment yields, improve water quality, reduce flooding on agricultural and wildlife lands, and improve the aesthetic setting within the watershed.

Component Needs

1. Preserve land quality by reducing sheet and gully erosion.

2. Improve water quality in streams and manmade bodies of water.

3. Create additional wetlands and bodies of water.

4. Maintain and improve native vegetation especially grasses, trees, and shrubs.

5. Insure proper management and maintenance of wildlife resources.

6. Provide grade stabilization on all critical sediment source areas.

7. Enhance the aesthetic and scenic values of the area by creating the pleasing contrasts of a well managed land environment.

8. Reduce road and bridge damage due to flooding.

Plan Elements

1. Install land treatment measures on 7,800 acres of cropland. These measures may include, but not be limited to, contour farming, terraces, grassed waterways, grade stabilization structures, conservation tillage and cropping systems, and field border plantings. Estimated costs of such needs are $514,000.

2. Improve 3,070 acres of pastureland with better management and treatment practices such as proper grazing use, deferred grazing, and planned grazing systems. In addition, pasture seeding is needed to improve pastures in poor condition and to convert about 2,800 acres of crop-

land back to grass. Further improvements can be attained through proper distribution of livestock grazing using additional cross fencing, salting facilities, and livestock water developments. Estimated total costs are $25,000.

3. Improve existing and establish additional woodlands. Existing woodlands can be improved by fully stocking stands of trees and protecting trees from detrimental use by domestic livestock, thus, allowing adequate ground cover to be reestablished. Plant additional trees such as commercial species including bur oak, cottonwood, red oak, walnut, and maple. Noncommercial species would include box elder, honey locust, and willow. The establishment of ground cover, primarily buck brush, in these areas will also provide excellent food and cover for pheasant, quail, cottontail rabbit, and browse for deer. The estimated cost for applying forest land treatment measures to 3,000 acres of woodlands, tree plantings on 2,500 acres, and the fencing of 2,000 acres of existing woodlands is $750,000.

4. Create additional wetland by installation of 200 shallow water developments or farm ponds. Surface area to be created would be about 10 acres per square mile. Improve and create wildlife food and cover by planting and fencing 0.5 acre plots of trees and shrubs at these 200 locations. Estimated cost of installing such measures is $835,000.

5. Create 73 acres of food planting plots throughout the watershed. These plots will be located adjacent to existing cover and will consist of grain sorghum, millet, or corn. Plots will be 1/4 acre in size and one plot will be located in each quarter section. All plots will be fenced. Estimated installation costs are $48,300.

6. Install 20 grade stabilization structures to establish a base grade to control gully erosion and to provide suitable outlets for land treatment measures on the 4,000 acres above these 20 critical sediment source areas. Estimated installation costs are $683,000.

7. Implementation of the plan will result in installation costs of $2,855,300 and operation and maintenance costs of $200,000. Total estimated cost of the plan is $3,055,300.

Institutional Arrangements

The University of Nebraska and it's Extension Service can provide research and other information useful in establishing, maintaining, and managing all types of vegetation and manmade bodies of water. Water quality and quantity information is also available.

The Soil Conservation Service would furnish information and technical assistance in all phases of plan elements. The Agricultural Stabilization and Conservation Service would furnish financial assistance through cost sharing on most environmental needs. These cost shares vary from year to year as to percent and types of elements. The Forest Service would furnish information and technical assistance regarding establishment and maintenance of woodlands.

The Nebraska Game and Parks Commission and the U. S. Fish and Wildlife Service would furnish information and technical assistance regarding biological needs, especially in areas of fish and wildlife, to provide for more effective integration of a fish and wildlife conservation program with federal water resource developments as outlined under the Fish and Wildlife Coordination Act, P.L. 85-624.

The Farmers Home Administration as well as local banks and other lending agencies have funds available for lending at various interest rates that could be used for most plan elements.

Local landowners and operators as well as local groups and organizations can furnish labor, land, and financial assistance toward the implementation of plan elements.

The Nemaha Natural Resources District and the Nebraska Natural Resources Commission would furnish information, technical assistance, and financial assistance towards fulfilling all plan elements.

Effects

The effects of improving land quality with the application of land treatment measures would be the most important feature of the environmental quality plan. It would be the basic feature upon which further enhancing features will depend. Application of land treatment measures on a minimum of 75 percent of the watershed area would reduce soil losses on crop and pasture to or below the established maximum allowable soil loss of 5 tons/acre/year.

Land treatment measures coordinated with grade stabilization measures on critical sediment source areas would reduce sheet, gully, and channel erosion by about 55 percent or 75,150 tons/year. This reduction in sediment would also reduce sediment related problems of water quality and water quality would be enhanced. All Class VI and VII land would be protected as permanent vegetation including grasslands or forests.

Forest land treatment measures applied on 3,000 acres of watershed woodlands would exert an important effect on runoff, streambank stabilization, and on sediment reduction. Tree plantings on 2,500 acres and the fencing of 2,000 acres of the existing woodlands would develop woodlands to the highest protective and productive level possible. Deferred grazing and livestock exclusion would promote the spread of ground cover and wildlife food and cover would be improved at least 100 percent on these 3,000 acres. An additional 100 acres of fenced trees and shrubs would be established around ponds and reservoirs to serve as wildlife habitat and to beautify and increase the recreation benefits of these areas.

The 73 acres of wildlife food planting plots would insure wildlife of a uniform food source throughout the watershed and create a more diversified habitat for wildlife to develop in, thus increasing the numbers of and types of wildlife species to be found in the watershed.

The installation of grade stabilization measures would provide the control to augment the effects of upland land treatment measures on 4,000 acres. Soil loss, land area loss, and aesthetically displeasing aspects of the degraded channel would be reduced. Application of needed vegetation associated with the channel would supplement wildlife conditions. Road and bridge problems would be reduced. A 51 percent reduction (40,000 tons/year) in sediment yields would improve water quality and the stream fishery would be enhanced.

Creation of wildlife habitat in the form of wetlands and upland habitat improvement on 900 additional acres in the watershed would substantially increase the carrying capacity of desirable species of wildlife such as Bobwhite quail, Chinese ring-necked pheasant, and songbirds. This would afford opportunities for the general public to enjoy bird watching, nature study, fishing, and hiking as well as supply food for the table and sport for the hunter.

Areas around water structures offer a unique opportunity for upgrading the overall habitat for many kinds of wildlife. This would tend to increase the quality of the natural resource base, the quality of the environment, and the quality in the standard of living for the overall population.

The water areas created would benefit wetland wildlife and provide resting areas for migrating waterfowl.

Guidance or assistance would be available to residential, industrial, or agricultural developments so that environmental conflicts may be adjusted. The social well-being of watershed residents would be enhanced with an increase in the opportunities for academic, cultural, and recreational pursuits.

WATERSHED WORK PLAN AGREEMENT

between the

Nemaha Natural Resources District
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of Nebraska

and the

Soil Conservation Service
United States Department of Agriculture

(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for Long Branch Watershed, State of Nebraska, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Long Branch Watershed, State of Nebraska, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about 8 years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire such land rights as will be needed in connection with the works of improvement. The percentages of this cost to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Land Rights Cost (dollars)
Multiple-purpose structure 21 & recreation facilities			
Payment to landowners for about 460 acres	50.0	50.0	184,000
Legal fees, survey costs, flowage easements, and other	100.0	0	1,100
Cost of alteration or modification of improvements	50.0	50.0	13,000
All other structural measures	100.0	0	196,400

The Sponsoring Local Organization agrees that all land acquired or improved with P.L.-566 financial or credit assistance will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the Operation and Maintenance Agreement.

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organization (percent)	Service (percent)	Estimated Relocation Payment Costs (dollars)
Relocation Payments	29.5	70.5	9,360

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to

state law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction cost of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Construction Cost (dollars)
Multiple-purpose structure 21	19.4	80.6	271,360
Recreation facilities for structure 21	50.0	50.0	122,220
12 Floodwater Retarding structures and 12 Grade Stabilization structures	0	100.0	1,237,900

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Engineering Costs (dollars)
12 Floodwater Retarding structures and 12 Grade Stabilization structures	0	100.0	110,500
Multiple-purpose structure 21	0	100.0	19,320
Recreation Facilities for structure 21, A and E contract	50.0	50.0	18,340

6. The Sponsoring Local Organization and the Service will bear the costs of Project Administration which it incurs estimated to be $9,270 and $264,150 respectively.

7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

10. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreement to be entered into prior to issuing invitations to bid for construction work.

11. The costs shown in this agreement represent preliminary estimates. In finally determining the cost to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

12. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

    A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.

14. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

15. The program will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the Regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12) which provide that no person in the United States shall; on the grounds of race, color, or national origin; be excluded from participation in, be

denied the benefits of, or otherwise be subjected to discrimination under any activity receiving Federal financial assistance.

16. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Nemaha Natural Resources District
(Local Organization)

By _____

Title _____

_____
Address Zip Code

Date _____

The signing of this agreement was authorized by a resolution of the governing body of the Nemaha Natural Resources District adopted at a meeting held on _____.

_____
Secretary, Local Organization

_____
Address Zip Code

Date _____

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

W. J. Parker

W. J. Parker, State Conservationist

MAY 21 1976
Date

WATERSHED WORK PLAN

Long Branch Watershed

Pawnee, Johnson, Nemaha, and Richardson Counties, Nebraska

April 1976

SUMMARY OF PLAN

Long Branch Watershed containing 46,905 acres is located in southeast Nebraska in Pawnee (7,226 acres), Richardson (20,672 acres), Nemaha (12,044 acres), and Johnson (6,963 acres) Counties. The watershed consists of four hydrologic units which are identified as Long Branch, Kirkham, Round Grove, and a small area east of Humboldt containing drains that outlet directly into the Nemaha River. The sponsoring local organization is the Nemaha Natural Resources District.

Principal watershed problems include floodwater, erosion, and sediment damages. Planned project measures will reduce floodwater damages by about 66 percent and will reduce overbank deposition and flood plain scour by about 84 percent. Overall damages within the watershed on areas affected by structures will be reduced about 74 percent.

Land treatment measures consisting of conservation cropping systems, contour farming, critical area plantings, diversions, field border plantings, grade stabilization structures, grassed waterways, pasture management, pasture planting, terraces, conservation tillage, forestation, improved forestry practices, forest protection, and wildlife habitat plantings will be installed.

The present and predicted land use pattern in Long Branch Watershed is as follows:

	Present		Future	
Land Use	Acres	Percent	Acres	Percent
Cropland	32,833	70	30,702	65
Pastureland	10,400	22	12,033	26
Woodland	3,037	6.5	2,800	6
Other Land	635	1.5	1,370	3

Forest land treatment is planned on 1,590 acres during the 8-year project installation period. Measures to be applied include tree planting, timber stand improvement, proper harvest, and forest protection. The Nebraska State and Extension Forester through cooperative agreement with the U. S.

Forest Service will provide forestry technical assistance to all landowners in the watershed.

Cost of forest land treatment will be $12,300 to be borne by landowners through cost sharing programs authorized by the Clarke-McNary Act or other available programs. The estimated cost of fire control measures is $40,000 to be borne by ongoing Cooperative Fire Control Programs in cooperation with the rural fire districts. Technical assistance costs will be $15,000 to be shared by P.L.-566,$12,000; the Nebraska State and Extension Forester, $2,750; and contributions from ongoing forestry programs, $250 (See Table 1). 1/

Twelve grade stabilization structures, 12 floodwater retarding structures, and 1 multiple-purpose floodwater retarding-recreation structure will be installed. Recreation facilities will be installed with the multiple-purpose structure.

The project installation period is estimated to be 8 years with a cost estimate at $2,902,020. Land treatment costs will be $445,100 and structural measure costs will be $2,456,920. P.L.-566 will pay $2,047,970 and other funds, $854,050.

The Nemaha Natural Resources District will obtain land rights, operate and maintain the structures, and provide leadership in the installation of land treatment measures. P.L.-566 funds will cost share on land rights for structure 21.

The estimated average annual cost of operation and maintenance of structural measures including recreational facilities is $11,240.

Total average annual benefits are $340,640 and total average annual costs are $164,410 for a benefit-cost ratio of 2.1 to 1.0.

1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

WATERSHED RESOURCES -

ENVIRONMENTAL SETTING 1/

PHYSICAL DATA

Long Branch Watershed is located in southeastern Nebraska in the counties of Richardson, Nemaha, Johnson, and Pawnee. The city of Humboldt, Nebraska is located at the confluence of Long Branch Creek and the North Fork of the Big Nemaha River.

Long Branch Watershed is comprised of four hydrologic units identified as follows: Long Branch Creek, Kirkham Creek, Round Grove Creek, and a small area east of Humboldt containing drains that outlet directly into the Nemaha River. Long Branch Creek drainage originates approximately 9 miles west and 14 miles north of Humboldt and flows in a southeasterly direction outletting into the North Fork of the Big Nemaha River in the southwestern city limits of Humboldt. Kirkham Creek drainage begins approximately 6 miles west and 7 miles north of Humboldt and then flows generally parallel and adjacent to Long Branch Creek to its junction with Long Branch approximately 2 miles northwest of Humboldt. Round Grove Creek drainage begins 5 miles west and 3 miles north of Humboldt and flows southeasterly outletting directly into the North Fork of the Big Nemaha River. The four small drains east of Humboldt that outlet directly into the Nemaha River have southerly flow and a maximum length of about 3 miles.

Long Branch Watershed is approximately 5 miles in width and 15 miles in length. It contains 46,905 acres (73.3 square miles) including 20,672 acres in Richardson County, 12,044 acres in Nemaha County, 6,963 acres in Johnson County, and 7,226 acres in Pawnee County. Topography on the bottomland varies from nearly level to gently sloping. Upland topography varies from gently sloping ridge crest to moderately steep valley sides.

Surface elevations range from approximately 963 feet mean sea level at the mouth of the watershed to 1,283 feet mean sea level on the divide. Total relief is 320 feet. Average channel grade in the watershed is 9.5 feet per mile.

The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides flood forecasting service for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is transmitted to City officials, newspapers, and radio and television stations in the basin. These media disseminate the information to residents of the flood plain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials, and individuals with property in the lowlands. Services available are of the following types:

1/ All information and data, except as otherwise footnoted, were collected during watershed planning investigations by the Soil Conservation Service and the Forest Service, USDA.

1. Flash Flood: The responsible Weather Service Forecast Office supplies weather forecasts twice daily for the State. In addition to the routine forecasts, special forecasts of severe storms and general flash flood watches for small streams are issued as required. WSR-57 Weather Radar installations have capability for immediate detection and evaluation of rainfall intensity, location, and storm movement. Information is promptly relayed by teletype circuits and telephone to news media and community officials and law enforcement agencies. The Weather Service Office issues Flash Flood Warnings as required for small streams in its area of responsibility.

2. Major Floods: River stage forecasts are based on radar coverage, reports from river and rainfall reporting stations and telemetry in or near the basin. The River Forecast Centers are staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short; however, lead time normally ranges from 12 hours for rainfall and up to several weeks for snowmelt. Specific crest forecasts are issued as required. River District Offices are responsible for the interpretation and distribution of flood forecasts and the operation of the hydrologic reporting substation network in its area of responsibility.

3. Hydroclimatic Data: Most of the data from the network is published. These records provide the basis for forecasts as well as for the planning and design of protective works and their operation during floods. River and flood forecasting is fundamental in the design and essential in the operation of a levee or reservoir system.

Most of the precipitation is from high intensity short duration thunderstorms. The expected magnitudes and frequencies of the rains that could occur during a 24-hour period are as follows: 100-year - 7.2 inches; 50-year - 6.5 inches; 25-year - 5.75 inches; 10-year - 3.25 inches; and 1-year - 2.65 inches. 1/

1/ Weather Bureau Technical Paper 40.

The maximum recorded 24-hour precipitation in the immediate vicinity is 8.72 inches on July 14, 1907, at Table Rock, Nebraska located 7 miles west of Humboldt. 1/

Rainfall often causes flooding problems along with gully and sheet erosion.

Average annual precipitation for Long Branch Watershed is 34 inches with approximately 70 percent of the precipitation occurring during the growing season. The average length of the growing season is 170 days from April 26 through October 12. The average annual temperature is 53.9 degrees. The monthly average temperature varies from 26.6 degrees in January to 79.5 degrees in July. 2/

The watershed is situated within the Nebraska and Kansas Loess-Drift Land Resource Area and Underground Water Area 11 - Southeast Nebraska Glacial Drift Region. 3/ The features of this area are similar to those in northeast Nebraska. The principal stream valleys are underlain by thin to moderately thick deposits of Pleistocene sand and gravel, and bedrock valleys beneath the glacial till are filled either with Pleistocene sand and gravel or finer grained fluvial sediments. Bedrock of Cretaceous, Permian, and Pennsylvanian age is exposed in many places, especially in ravines and along valley sides. The Dakota Sandstone of Cretaceous age is the uppermost bedrock throughout a broad band in the northwestern and western part of the region and is available as a bedrock source of water when permeable zones are saturated. Pennsylvanian and Permian limestones and shales form the uppermost bedrock in the remainder of the region and do not provide a satisfactory source of groundwater because of low permeability or high mineralization.

The principal use of water in the watershed is for domestic use, both rural and urban. The domestic rural source is usually inadequate; however, the new rural water system presently under development will provide an adequate supply.

The upland areas within the watershed are mantled with a varying thickness of Peoria and Loveland Loess. Below the loess is a weathered phase of the Kansan Drift. The Kansan drift proper is below the weathered phase and consists of a heterogeneous mass of clay, silt, sand, gravel, and boulders. Below the Kansan drift lies Aftonian material consisting of stratified sand and gravel with a few boulders. This does not occur as a continuous stratum but as sand or gravel trains. This material outcrops west and northwest of Humboldt.

1/ Weather Bureau Technical Paper 16.
2/ For further information on climate and character of damaging storms, refer to "Climates of the States - Nebrasa", Climatological Data - Nebraska, and Weather Bureau Technical Papers 40 and 57.
3/ Underground Water Area Map - Compiled by E. C. Reed. Published by Conservation and Survey Division, University of Nebraska - Lincoln, January 1, 1969.

The lowest drift (Nebraskan) does not outcrop nor was it encountered during subsurface investigations in the watershed.

The loess and drift beds lie on an uneven surface of bedrock belonging to the Pennsylvanian division of the Carboniferous System. The upper layers of bedrock consist of well-defined beds of shale and limestone, the shale grading into sandstone locally. The mantle of rock is from 20 to 100 feet deep with only local outcrops.

Flood plain unconsolidated deposits are represented by fluviatile deposits of Peoria, Loveland, Grafton, and Sappa with the Grand Island sand and gravel member, clays, silts, and sands. Recent alluvial deposits mantle the flood plain to moderate depths.

The soils in the Long Branch Watershed are developed in three basic soil associations. These soil associations and their principal characteristics are as follows:

Kennebec-Judson-Wabash association 1/: Deep, nearly level to gently sloping, silty and clayey soils formed in alluvium on bottom lands and colluvium on foot slopes.

This soil association consists of foot slopes, bottom lands, and stream terraces in the valleys of the Big Nemaha River and adjoining streams. Slopes range from nearly level to gently sloping. This association represents the lowest relative elevations of the landscape. Some areas on bottom lands are flooded for short periods after heavy rains. Kennebec, Judson, and Wabash soils are dominant. Kennebec soils are deep and moderately well drained. They formed in silty alluvium near the rivers and creeks. Kennebec soils have a black silt loam surface layer and very dark grayish-brown silt loam underlying material.

Judson soils are deep, well drained, and on foot slopes. They formed in silty sediments locally washed from adjacent uplands. These soils have a black silt loam or silty clay loam surface layer and a dark brown silty clay loam subsoil.

Wabash are deep, poorly drained soils formed in clayey alluvium. Wabash soils are nearly level and in depression-like areas. They have a black silty clay surface layer and a very dark gray underlying material.

Small areas of silty alluvial land occurring along meandering streams and creeks are subject to frequent overflow.

1/ Refer to the Nemaha River Basin, Nebraska, Type 4 Report, Economic Research Service, Forest Service and Soil Conservation Service (USDA), July 1974, for a general soil association map and additional soils data. Soil survey reports for Pawnee and Richardson Counties are completed, but not published. Information in these reports can be obtained at the SCS field offices.

Most of the acreage is cultivated. Corn, grain sorghum, and wheat are the principal crops.

The principal limitations when using these soils are maintenance of fertility levels and good tilth. Flooding is a hazard and the need for drainage is a concern of management in some areas. Water erosion is ordinarily not a hazard except on the gently sloping Judson soils.

Wymore-Pawnee association 1/: Deep, nearly level to strongly sloping moderately well drained, silty and loamy soils with clayey subsoils; formed in loess and glacial till; on uplands.

This association is on the loess and till uplands. The nearly level and gently sloping ridgetops are loess capped. The soils on sloping sideslopes to valleys are commonly formed in glacial till. Included are the uppermost parts of some natural drainageways. This association represents some of the highest elevations of the landscape in the upper part of the basin.

Wymore and Pawnee soils are dominant. The nearly level to gently sloping Wymore soils are on ridgetops and are deep and moderately well drained. They formed in loess. The surface layer is black silty clay loam. The subsoil is grayish brown silty clay. The underlying material is mottled olive gray silty clay loam.

Pawnee soils are deep, gently sloping to strongly sloping and are moderately well drained. The surface layer is very dark brown clay loam. The subsoil is brown clay. Below a depth of 3 feet is olive brown heavy clay loam.

Minor soils in this association are Judson soils on colluvial foot slopes, Kennebec soils on narrow bottom lands and Burchard soils on sloping valley sides.

A large portion of this association is used for cultivated crops. Grain sorghum and wheat are the principal crops, but corn and alfalfa are also grown. Grain sorghum is grown more than corn, because the soils release moisture slowly to plants during hot, dry days. Concerns of management are controlling runoff and erosion and selecting crops that are best suited to the soil and climate.

Pawnee-Burchard-Wymore association 1/: Deep, gently sloping to moderately steep, moderately well drained and well drained, loamy and clayey soils, formed in glacial till on uplands.

This association consists of the tops and sides of upland ridges and the dissected upper valley hillsides. These soils have formed largely in material of glacial origin. A few loess capped ridge tops are on less sloping areas. Slopes range from gently sloping to moderately steep.

1/ See footnote 1 on page 6.

Included are many narrow bottoms of the drainageways that extend into the uplands. Boulders, stones, gravel, and sand pockets are at the surface in many places. Many areas are severly eroded. Extensive areas are in the lower more dissected part of the basin.

Pawnee, Burchard, and Wymore are the dominant soils.

Pawnee soils are deep, gently sloping to strongly sloping and are moderately well drained. They are on ridgetops above the Burchard soils. The surface layer is a very dark brown clay loam. The subsoil is a brown clay. Below a depth of 3 feet is olive brown heavy clay loam.

Burchard soils are deep, well drained soils formed in glacial till. They are not so fine textured in the subsoil as Pawnee or Wymore soils. The surface layer is very dark brown clay loam. The subsoil is a grayish-brown clay loam. The underlying material is mottled olive brown clay loam.

Wymore soils are deep, moderately well drained soils formed in loess. They are on ridgetops in the highest part of the landscape. The surface layer is black silty clay loam. The subsoil is grayish brown silty clay. The underlying material is mottled olive gray silty clay loam.

About 50 percent of this association is used for cultivated crops. The remainder is mainly in hayland, pasture, and range. The principal cultivated crops are grain sorghum and wheat. Erosion by water is the principal hazard to the soils of this association. Other concerns of management are maintenance of fertility. Areas in grass need grazing control and weed and brush control to insure vigorous growth of the grasses.

The Kennebec-Judson-Wabash, Wymore-Pawnee, and Pawnee-Burchard-Wymore soil associations are present within the watershed boundaries in the following percentages, respectively, 17%, 23%, and 60%.

About 22 percent of the watershed cover is in pastureland rated as having fair to good hydrologic conditions. These grasses are randomly scattered throughout the watershed on soils of varying slopes and consist of little bluestem, brome grass, Indian, big bluestem, switch grass, and sideoats grama plus other species of lesser importance. Pasture conditions were determined to be approximately 30 percent excellent, 20 percent good, 20 percent fair, and 30 percent poor.

Watershed woodlands consist of a mixture of hardwood species. The main commercial species found are bur oak, cottonwood, green ash, red oak, walnut, and maple. The main noncommercial species found are elm, box elder, honey locust, and willow. An estimated 60 percent of the woodland acres are located along the water courses in narrow bands. The remaining woodland acres are located on upland slopes and tend to be mature even aged stands of bur oak. 1/

1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

From representative samples and examination of aerial photographs it was determined that of the 3,037 acres of watershed woodlands, 1,974 acres or 65 percent is being grazed and 2,533 acres or 83 percent is understocked. 1/

The woodland sites are well adapted to the production of high value hardwoods and would produce rapid growth. 1/

Some modification of the natural Long Branch channel has occurred in the lower 3.5 miles. The total length of the various segments which have been modified is approximately 1.9 miles. These 1.9 miles would therefore classify as "M" or modified channel. The remainder of Long Branch and all of its tributaries classify as "N" or well defined natural channels or streams. The flow in the lower 12 miles of Long Branch as well as the flow in the lower 4 miles of Kirkham Creek is classified as "Pr" or perennial. The flow in the lower mile of tributaries on which structures 7, 41, and 70 will be located is classified as "I" or intermittent. The flow in all other tributaries is classified as "E" or ephemeral. The lower 12 miles of Long Branch Creek and the lower 4 miles of Kirkham Creek are classified as Category I, Class "B", Perennial Waters. 2/ The balance of Long Branch and Kirkham Creeks and the lower mile of tributaries, on which structures 7, 41, and 70 will be located, are under Category II, Intermittent Waters. The remaining channels and tributary drains within the watershed are ephemeral streams and are not classified under present Nebraska water quality standards.

Category I waters apply to perennial flowing waters with a 7-consecutive day, 1-in-10 year low flow greater than 0.1 cfs. Category II consists of waters which have periodic zero flows (7-consecutive day, 1-in-10 year low flow) and/or which have a 7-consecutive day, 1-in-10 year low flow less than 0.1 cfs.

Class "A" quality waters are suitable for full body contact sports, domestic water supplies, growth and propagation of fish, waterfowl, furbearers, wildlife, and other aquatic and semiaquatic life.

Class "B" quality waters are suitable for partial body contact sports, growth and propagation of fish, waterfowl, furbearers, wildlife, and other aquatic and semiaquatic life. It is also suitable for agricultural use, including irrigation, livestock watering, and industrial use.

Historical water quality records are scarce for Long Branch Watershed. Some recent samples have been collected and tests run by the Nebraska Department of Environmental Control. The results of the tests are tabulated as follows, on the next page.

1/ See footnote 1 on page 8.
2/ Water Quality Standards Applicable to Nebraska Waters, State of Nebraska Department of Environmental Control, June 11, 1973.

Sample Location	Date Begun	Number of Samples	pH Min.	pH Max.	DO Min.	DO Max.	Total Dissolved Solids Min.	Total Dissolved Solids Max.	Conductivity Min.	Conductivity Max.
			(SU)		(mg/l)		(mg/l)		(umho/ccm)	
A	3/22/74	8	7.8	8.5	5.1	11.0	284	382	419	628
B	3/22/74	8	8.0	8.5	6.2	13.0	270	342	399	540
C	3/22/74	8	8.05	8.5	6.4	11.6	264	402	419	621

Sample Location	Water Temperature Min.	Water Temperature Max.	Nitrate Expressed as N (NO_3) Min.	Nitrate Expressed as N (NO_3) Max.	BOD 5-day One Sample	COD High Level One Sample	Fecal Coliform One Sample
	(oC)				(mg/l)	(mg/l)	(MF/100ml)
A	7.0	24.0	0.1	1.8	5.2	19	0
B	6.0	27.0	1.1	2.4	3.4	15	1250
C	6.0	26.5	0.1	4.1	3.3	23	-

Sample location A is situated immediately downstream from the recreation site (No. 21) on Kirkham Creek, location B is one mile north of highway no. 4 and Long Branch Creek, and location C is at the highway no. 4 bridge and Long Branch Creek. All samples were collected at road crossings.

A quarterly water sampling schedule has been set up in Long Branch and other watersheds within the Nemaha Basin. Samples will be collected at these points on a quarterly or storm event schedule by designated Soil Conservation Service personnel and water quality tests will be performed by the Nebraska Department of Environmental Control.

These samples will be collected on a regular basis during the planning process and test results will be monitored to determine if any changes in structural designs or other phases of the planning process are needed to maintain or improve present water quality.

An additional sampling area has been selected approximately 1 mile above the recreation structure to provide data for an assessment of waters flowing into the impoundment area.

PRESENT AND PROJECTED POPULATION

Year	Urban Population	Percent	Rural Population	Percent	Total Population	Percent
			Nemaha Basin			
1970	22,840	35	42,280	65	65,120	100
2020	28,000	42	39,000	58	67,000	100
			Long Branch			
1970	1,194	69	546	31	1,740	100
2020	1,463	75	500	25	1,963	100

Population studies in the Nemaha River Basin Report project an increase of 22 percent from 1970 to 2020 in the urban population, a decrease of 8 percent in the rural population and a net increase of only 3 percent. 1/ Of greater significance is the OBERS 2/ projections which project an increase of 53 percent on the same time frame in the general area of southeast Nebraska which includes the cities of Lincoln and Omaha.

Urbanization is expected to continue within the watershed while very little change occurs in the rural sector. Pressure from increase in population will come from outside the area of the Nemaha Basin in which Long Branch Watershed is located.

ECONOMIC DATA

Livestock and cash-grain farms predominate in Pawnee, Johnson, Richardson, and Nemaha Counties. The bulk of the feed grains produced in Long Branch Watershed is utilized within the watershed.

Long Branch Watershed land is utilized in the following manner:

Cropland	70 percent
Pasture	22 percent
Woodland	6.5 percent
Other Land	1.5 percent

Land use patterns of the Long Branch Watershed flood plain are as follows:

Cropland	85 percent
Pasture	12 percent
Woodland	1 percent
Other Land	2 percent

1/ Nemaha River Basin Type IV Report (1973).
2/ OBERS - Office of Business Economics and Economic Research.

Principal crops presently grown in the watershed include corn, grain sorghum, wheat, alfalfa, and introduced grass pastures. The estimated annual gross value, $82.75, of production per acre in the flood plain was based on the following yields: corn, 106 bushels; grain sorghum, 115 bushels; soybeans, 36 bushels, wheat, 52 bushels; and alfalfa, 5.2 tons.

Timber is a very minor source of revenue compared to crop and livestock returns. Stands show the effects of a general misunderstanding of the importance of proper timber management. Years of cutting the better trees and leaving the inferior species has left many stands dominated by trees of low commercial value. The damage to woodlands by grazing far outweighs the value of the forage. 1/

Two new sawmills have been established approximately 3 miles west of the watershed boundary at Table Rock. These sawmills will greatly decrease the hauling distance for timber products and should stimulate interest in proper harvest techniques. 1/

The watershed is served by agricultural markets in Pawnee City, Humboldt, Falls City, Auburn, Tecumseh, Johnson, Elk Creek, and Table Rock, Nebraska and Seneca, Kansas. Nebraska State Highways 4, 105, and 62 and several secondary roads provide access to agricultural markets for farms located in the watershed.

The population of Long Branch Watershed is estimated at 1,740. It includes 546 people living on farms and 1,194 (1970 census) living in Humboldt.

The average value of agricultural products sold per farm, according to 1969 census data, ranges from $14,390 in Pawnee County to $25,740 in Richardson County. The overall average value of agricultural products sold in the Long Branch Watershed is $20,770 per farm.

The economy of the Long Branch Watershed is agriculturally based and will continue to be agriculturally based after the watershed project is completed. It is estimated that there are about 147 farms in the watershed which average 315 acres in size. It is expected that the trend toward fewer but larger farms, caused by technological changes, will continue.

The average farm in the watershed is a typical one family operation. Data indicates that only 3.9 percent of the farms employ more than 150 hours of labor annually. The average size of farms of 315 acres in 1969 is well within the reach of a family operated farm. 2/

In 1969 the average value of land and buildings was $84,840 and the average price per acre was $240. From 1967 to 1973 land prices have increased 45 percent in Nebraska. 3/ This increase plus a $12 per acre premium for

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1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.
2/ "1969 Census of Agriculture".
3/ Economic Research Service Farm and Rural Land Survey, March 1973.

bottomland would make a conservative value per acre of $360 per acre for bottomland.

SURFACE WATER RESOURCES

Long Branch Watershed is an ungaged tributary of the North Fork Big Nemaha River. The North Fork Big Nemaha River has been monitored by the United States Department of the Interior Geological Survey since 1952. The gage is located at Humboldt, Nebraska, with the station number of 06814500 and named North Fork Big Nemaha River at Humboldt, Nebraska. The drainage area of the gage is 548 square miles and over the period of record has had an average discharge of 125,300 acre-feet per year; therefore, the water yield for the basin can be assumed to be 4.28 inches per acre. The total drainage area in Long Branch is 46,905 acres, resulting in a present watershed yield of approximately 17,000 acre-feet per year.

FISH AND WILDLIFE RESOURCES

Many species of wildlife exist in the watershed. Density of the bobwhite quail is moderate (100 to 300 per square mile) while pheasant population is low (10 to 50 per square mile). Cottontail rabbit population is moderate (100 to 300 per square mile) and the density of deer varies throughout the watershed from 1 to 8 per square mile. Fox, raccoon, coyote, muskrat, and mink are found in the area. The population of mourning doves is rated high; however, few waterfowl make use of the area. 1/

Lands within the watershed are privately owned and access to the existing resource is limited only in that permission for right of entry must be obtained from the landowner.

The only stream reach rated as productive for fish in the watershed is the lower 10 miles of Long Branch and this warm water fishery is classified as of local importance only.

Increased sediment deposition after high intensity rainfalls adversely affects production of food organisms upon which fish depend.

RECREATIONAL RESOURCES

The nearest existing water body with substantial recreational use is the Tuttle Creek Reservoir, a large U. S. Army Corps of Engineers reservoir on the Big Blue River near Manhattan, Kansas. This impoundment is approximately 70 miles distant and this distance is a factor limiting the use of Tuttle Creek for waterbased recreation by residents in and adjacent to Long Branch Watershed.

1/ The Nebraska Fish and Wildlife Plan (Volume 1) - By the Nebraska Game and Parks Commission.

There are three Special Use Areas located within 30 miles of the watershed.

Pawnee Prairie Special Use Area is located about 3 miles northeast of Summerfield, Kansas. Pawnee Prairie consists of 1,120 acres managed mainly for wildlife production and public hunting of upland game and deer. There are also 6 small ponds on the area, with a total of about 10 surface acres of water. These ponds provide a bass - bluegill fishery used mainly by local residents.

Iron Horse Trail Special Use Area consists of scattered parcels of abandoned railroad right-of-way extending from DuBois to Beatrice, the largest contiguous strip of which is about 1.5 miles long. Most segments of this linear public use area run in the range of 0.25 to 0.5 mile. Total area of the scattered parcels amounts to about 210 acres. Principal recreation uses are hunting (squirrel and bobwhite quail), nature study, and hiking.

Burchard Lake State Special Use Area contains a 160-acre lake owned and operated by the State of Nebraska. Its primary function is for wildlife management purposes. It has a day use area and turn-outs for primitive camping. It does serve some local and regional park needs even though that is not the primary administrative function of the area. This lake supports considerable fishing pressure and is available for restricted boating use.

The state recreation area at Verdon, about 15 miles southeast of Long Branch Watershed, includes a 30-acre lake and provides basic camping facilities.

Local interest in the development of waterbased recreation is increasing. Several small watersheds have the opportunity to develop recreational structures. A recreation structure near DuBois with a water surface area of 85 acres is included in the work plan for South Fork Watershed. Two recreation structures have been constructed near Beatrice. One of these is Rockford Lake which has about 150 acres of water in Mud Creek Watershed and the other is a 77-acre lake in Big Indian Watershed.

In the Lincoln and Beatrice Socioeconomic areas there is a total of 16,806 acres of Class I, II, and III nonurban recreational lands as of 1967 and a deficiency of 2,782 acres. By the year 2000 this deficiency is projected to increase to 35,945 acres. 1/

The Lincoln and Beatrice Socioeconomic areas have a need in 1972 for 838 acres of picnic lands and 5,864 tables. The present supply is 575 acres of land and 2,449 tables, leaving a deficit of 275 acres of land and 3,415 tables. The projected need for the year 2000 is 1,672 acres of land and 11,688 tables and the estimated deficiency is 1,154 acres of land and 9,454 tables. 1/

There is a need for 570 acres of campgrounds and 2,853 units of camper spaces to meet the camping needs in the Lincoln and Beatrice Socioeconomic areas.

1/ "A Comprehensive Plan for Outdoor Recreation for Nebraska (1968)".

The supply in 1972 is 98 acres of campgrounds and 490 units of camper spaces, leaving a deficiency of 472 acres and 2,363 units in 1972. The projected need for camping in 2000 is 1,520 acres and 7,597 units, leaving a deficiency of 1,422 acres of campgrounds and 7,107 camping spaces.

ARCHEOLOGICAL AND HISTORICAL VALUES AND UNIQUE SCENIC AREAS

The archeological, historical, and architectural report states that the project measures will not affect any archeological sites. No historic sites, historic buildings, or buildings of architectural significance will be affected by construction of, or inundation by, project measures. 1/

Consultation with the State Historic Preservation Officer and the latest available monthly supplement to the National Register of Historic Places indicates that no National Register property will be affected by the proposed structural measures.

SOIL, WATER, AND PLANT MANAGEMENT STATUS

There are about 100 acres of woody pasture located along the flood plain below proposed structures to their junction with Long Branch Creek. About 30 acres are located adjacent to the stream with the remaining acres located on steep slopes associated with normal channel entrenchment. The first area to be flooded is the wooded area near the stream and this area will still have out-of-bank flows on the average of at least once every four years even with project installation. The additional acres are unsuitable for cropland or pasture primarily because of slopes in excess of 10 percent or inaccessability due to wide meander pattern of the stream channel.

It is expected that some conversion of woody pasture to cropland along the flood plain will continue but with the level of protection achieved, based on similar conditions in other watersheds, it does not appear that significant land clearing will take place as a result of the project.

The area subject to flooding from a 2-year flood frequency totals 970 acres; the area flooded from a 5-year flood frequency totals 1,594 acres.

Eighty-one percent of the watershed area is covered by agreements between the landowners and the sponsoring local organization to provide conservation land treatment and 50 percent of the planned practices have been applied. There are presently 206 cooperators in Long Branch Watershed. The district has 199 basic conservation plans written on farms and ranches in the watershed.

Standard soil surveys have been completed in Richardson and Pawnee County portions of the watershed which represents approximately 60 percent of the area.

1/ Prehistoric and Historic Resources Report, November 1974, Department of Anthropology, University of Nebraska-Lincoln.

Improper land use has been observed within the watershed and is associated with random farm units, some of which are in need of complete land treatment. Much of the pasture is overgrazed 50 percent of the time.

WATER AND RELATED

LAND RESOURCE PROBLEMS

LAND TREATMENT

Land treatment in the watershed is desired basically because there is a need to maintain soil moisture and prevent water erosion. In order to properly treat the soils their basic properties should be known. Such information is available from the standard soil survey of Pawnee and Richardson Counties, but the standard soil surveys for Johnson and Nemaha Counties have not been completed. Soils are deep, fertile, and moderately to highly productive. These soils are highly susceptible to sheet and gully erosion with a resultant loss in production and increase in farming operation costs. Approximately 4,000 acres of cropland are experiencing severe sheet and gully erosion due to the presence of an unstable grade. Unstable grades create conditions where suitable outlets for runoff water cannot be maintained. The absence of a suitable outlet limits the use that may be made of land above an unstable grade and limits the net return from the land.

There is a need for establishing permanent cover on approximately 2 percent of the watershed currently being cropped.

The scattered nature of the woodland stands, relatively low site quality and small areas, has discouraged improved woodland management. Grazing and sheltering is common in many of the stands with the resulting effect of soil compaction and loss of litter and humus.

There is a need to prevent the reproduction of undesirable woodland species and also to protect valuable species that exist within the watershed. There is a lack of understanding among landowners regarding possible tree damage from chemical spraying and the multiple-use benefits that can be derived from proper woodland management.

Approximately 65 percent of the woodland suffers from varying degrees of grazing pressure. The beneficial effects of woodland in retarding surface flow and erosion are greatly reduced by grazing.

The dead timber in the woodlands is primarily American Elm trees located in isolated areas along the stream courses. These dead trees can create a potential hazard to the stream channel from clogging, thus reducing channel capacity during flood flows.

Approximately 83 percent of the woodlands in the project area are understocked or are comprised of undesirable species.

Continued control of wildfires is needed for both the hydrologic and economic benefits of the woodlands. 1/

1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

FLOODWATER DAMAGE

Damaging floods occur annually on the Long Branch flood plains. The majority of the flooding occurs during the months that crops are growing and are thus most vulnerable to damage. The relatively smaller storm events (5-year frequency or smaller frequency storms) are responsible for the bulk of present floodwater damages. Records indicate that floods occur on an average of 3 times every year. The storm that might be expected to occur once in 100 years would flood about 2,570 acres while a storm that could be expected to occur once every 5 years would flood about 1,594 acres.

The land use pattern for Long Branch Watershed is as shown on page 11. Primary crops grown include corn, grain sorghum, and soybeans with small tracts in wheat or alfalfa. At the present time about 56 landowners are involved in farm operations within the flood plain boundaries. Rural flood damages are restricted to crops, related agricultural damages, and road and bridge. There are no farmsteads receiving flood damages in Long Branch Watershed.

The lower reach of Long Branch Creek passes through the west portion of Humboldt, Nebraska. Flooding to two basements begins at the 25-year flood frequency. At the 50-year flood frequency an additional nine residences and the city park receive damages with a total of 16 residences receiving flood damages at the 100-year frequency flood. The average annual flood damages, by category, are listed in Table 5.

EROSION DAMAGE

Sheet erosion is the dominant erosion factor in the watershed, accounting for approximately 64 percent of all sediment movement within the watershed.

Total gross erosion in the watershed approximates 582,300 tons/year, 373,000 tons/year from sheet erosion and 209,300 tons/year from gully erosion. Under present conditions annual soil losses on untreated cropland range from 7 tons/acre-year on 0 - 3 percent slopes to 19 tons/acre/year on 3 - 9 percent slopes. An average yield from untreated cropland sheet erosion approximates 14 tons/acre/year. Soil losses from untreated pastureland on average slopes of 10 - 15 percent range from less than 5 to 7 tons/acre/year.

Gully, streambank, and channel erosion are active in the watershed. Gully erosion contributes 36 percent or 209,300 tons/year of the total gross erosion yield and is categorized within the following elements:

Critical source areas	49,300 tons/year
Main channel bank erosion	15,000 tons/year
Remaining tributary areas	145,000 tons/year

Twenty critical source areas were identified and investigated in the watershed. Approximately 20 miles of the main channel of Long Branch is undergoing bank erosion at the rate of 0.47 acres/mile/year. Data obtained from the

Platte Level B Study on critical sediment sources was projected for use in similar areas undergoing bank erosion in the Long Branch Watershed. Approximately 225 miles of major tributaries and upland drains are contributing sediment in the form of gully and bank erosion at the rate of 0.40 acres/mile/year. 1/

Gully growth, void damage, will physically destroy approximately 3 acres of cropland annually during the 50-year evaluation period. The void damages will average $4,750 annually.

In addition to direct damages resulting from gully growth, economic returns to land above an unstable grade are reduced. The absence of a suitable outlet for runoff water severely limits the use that may be made of land above an unstable grade and limits the net return from the land. An estimated loss of $70,000 from 4,000 acres of land is being sustained due to these associated land damages. Although the total estimated loss from gully erosion is estimated to be $70,000, only the damages and benefits which are affected by structural measures are displayed in Table 5. Gullies will also damage roads and bridges at one location for an average annual damage of $380.

Deep gullies are also hazardous to livestock and often prevent livestock from crossing drains to pastures. Farm equipment and equipment operators are also subjected to hazardous conditions as a result of gully growth and associated ditches and bank sloughing. Gullies also detract from the overall appearance of the specific area and the countryside in general.

SEDIMENT DAMAGE

Presently 187 acres or 11 percent of the flood plain subject to annual flooding is undergoing sediment and scour damages. Estimated average annual sediment and scour damages of $4,950 (Table 5) are occurring in the watershed. Sediment and scour damages are closely related items in the watershed and they were not treated separately.

Sediment yields from the watershed are moderately high to high. Windblown deposits and glacial soils susceptible to erosion in combination with steep (6 percent) slopes and high rainfall are the prime factors contributing to the high sediment yields.

Approximately 212,000 tons of sediment, 89,500 tons from sheet erosion and 122,500 tons from gully and streambank erosion, are deposited annually within the channel and flood plain boundaries below planned structural measures. Approximately 65 percent (137,800 tons) of this sediment yield reaches the mouth of the watershed at the Nemaha River. Quantities of sediment delivered to major streams reduce stream capacity and are harmful to stream fishery resources. This sediment also reduces water quality and contributes to a general degrading of the environment because insecticides, herbicides, heavy

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1/ Channel and Streambank Erosion Studies in the Platte Level 'B' Study, 1974. A joint study among the Soil Conservation Service, Corps of Engineers, and the Bureau of Reclamation.

chemicals, and phosphates from fertilizers used in agricultural production adhere to or are adsorbed by sediment particles. Nitrogen is also carried in runoff sediment, particularly in organic form and as adsorbed ammonium on clay particles.

Total estimated sediment and erosion damages of $48,700 are occurring in the watershed annually. In addition, $10,880 of annual downstream sediment damages are occurring.

Shown below is a tabular breakdown of floodwater, sediment, and erosion damages by stream reaches.

Present Flood Plain Damages Without Project Installation

Reach	I	II	III	IV	V	Total
Acres Flooded (Crop and Pasture) by Flood Frequency						
2	0	38	813	91	28	970
5	54	191	1,114	166	69	1,594
10	146	247	1,230	242	138	2,003
100	182	308	1,408	346	325	2,569
Dollar Damages (Crop and Pasture) by Flood Frequency						
2	0	1,679	29,661	3,456	1,145	35,941
5	1,272	6,587	47,893	6,892	2,555	65,199
10	5,824	9,842	58,031	10,551	5,278	89,526
100	10,669	14,744	78,302	18,017	13,887	135,619
Sediment and Scour Damages (Av.Ann.)						
Acres	14	34	107	29	3	187
Dollars	159	598	1,921	592	69	3,339
Urban Damages (Av.Ann.)						
Dollars	380	-	-	-	-	380

WATER QUALITY PROBLEMS

Test results of water quality samples collected are tabulated on page 10.

The nitrate concentration ranging from 1.8 to 4.1 mg/l would induce algae growth in impounded water provided that a high phosphate level is present. The possible buildup of nutrients in such impoundments could result in eutrophication of the reservoirs, however, with the expected spring and early summer turbidity,reservoir water will suppress the growth of algae

and rooted aquatic vegetation. 1/ Turbidity may exceed the Class "A" water quality standards during peak runoff periods but it is not expected to exceed the standards during nonrunoff periods.

MUNICIPAL AND INDUSTRIAL WATER

The watershed is rural. Surrounding urban areas have a limited supply of water, but rural water districts have been organized that will result in additional water supplies to rural areas. Humboldt water supply is obtained, via pipeline, from a well located approximately 4 miles north of the city. There are three older wells in Humboldt that can be put in use if a water shortage develops. The system is presently providing an adequate water supply.

RECREATION

Nebraska is divided into 14 socioeconomic areas (SEA's). About 33 percent of the Long Branch Watershed lies in the Lincoln SEA and the balance in the Beatrice SEA. The population within a 50-mile radius of Humboldt is 92,000. In most socioeconomic areas of the state the population is projected to decrease, but the Lincoln SEA population is projected to increase from 247,300 in 1967 to 343,897 in 1985, a 39 percent increase. 2/

The Comprehensive Plan estimates various significant recreational deficiencies in the Lincoln and Beatrice SEA's. In 1972 the plan estimates a deficiency of approximately 7,500 acres of land and 48,000 acres of water developed for recreational activities. Included in the overall deficiencies are 270 acres of picnic area, 11,900 acres of water for boating, 5,500 acres for water skiing, 472 acres for camping, and 30,500 acres for fishing. Deficiencies projected for the year 2000 are estimated to be 344 percent higher than in 1972 for developed land and 248 percent higher for developed water.

FISH AND WILDLIFE

The limiting factor for fish and wildlife species in the area was determined to be a lack of ground cover in wooded areas due to heavy use by livestock and a lack of wetland areas created by water impoundment. 3/ Land treatment measures to reduce sedimentation and improve water quality, shelterbelts, woody plantings, and food plantings to improve cover and feeding areas are needed to provide additional and improved wildlife habitat. Water and the shoreline of additional impoundments is needed to improve the habitat of shorebirds, wood ducks, and all waterfowl species.

1/ TRANSACTIONS of the Nebraska Academy of Sciencies, Volume II.
2/ "A Comprehensive Plan for Outdoor Recreation for Nebraska" (1968).
3/ Report of Fish and Wildlife Investigations - December 8, 1972. Joint field study by staff biologists representing the Soil Conservation Service, Fish and Wildlife Service, and Game and Parks Commission.

ECONOMIC AND SOCIAL

The average size of farms in the Long Branch Watershed is 315 acres. 1/ The average net value of agricultural products sold per farm was $8,152 compared to a state average of $9,605. Thus the farm units are below the state average in net production. This is a generalized farming area with relatively small family farms.

About 15 percent of the Long Branch Watershed lies in Pawnee County. Pawnee County was designated to be a Redevelopment Area in 1966 under provisions of the Area Development Act (P.L. 87-27). The major criteria qualifying an area to be a Redevelopment Area was that the rate of unemployment was 6 percent or more at the time of designation and that the unemployment rate had been 50 to 100 percent above the national average for 1 to 3 prior years. Areas adjacent to Pawnee County should not radically change at the county lines; therefore, a valid generalization would be that the unemployment rate in Long Branch Watershed is above the national average.

The general income of workers in the area of Long Branch Watershed is lower than for the State of Nebraska. The median income for families in the Long Branch area was $3,030 as compared to $4,862 for the state, or about 62 percent as much. The mean income per person in the area of the watershed was $2,346 while the comparable figure for the state was $3,239, or about 72 percent as much. 2/

Long Branch Watershed is located in Water Resources Region 1024 and the per capita income in 1969 in this region was 88 percent of the national average. 3/ The earnings per worker were 79 percent of the national average. The ratio of employment to population was 42 percent compared to the national average of 40 percent.

1/ "1969 Census of Agriculture".
2/ Census of Population for Nebraska, Volume I, Part 29.
3/ 1972 OBERS Projections - Volume 4 - U.S. Water Resources Council.

PROJECTS OF OTHER AGENCIES

A study of the Big Nemaha River Basin was made by the Corps of Engineers during the period 1968 - 1973. Six dam sites in the basin were investigated as a possible means of reducing flooding and providing recreational opportunities. One of these was the Humboldt site which would have been on Long Branch near its outlet to the Nemaha River. Possible levee and channel modification projects were also studied in the basin. A public meeting concerning the Corps of Engineers study was held in Tecumseh on April 10, 1973, at which time the Corps of Engineers reported that none of the structural alternatives were economically justifiable and would not be recommended for project action.

The Bureau of Reclamation's "Nemaha River Basin Reconnaissance Report" dated June 1965, indicates there is no significant prospect for the development of project type irrigation in the basin.

A rural water district has been organized and the system is presently being installed through assistance from the Farmers Home Administration.

PROJECT FORMULATION

It was the intent of the Long Branch sponsoring local organization and the Soil Conservation Service to encourage the participation of interested public agencies and particularly of the general public in the planning process by keeping them informed of planning progress and providing them with forums to discuss their respective opinions. The diverse interests expressed by the public agencies and private citizens were considered in the formulation of the project.

A Steering Committee for Long Branch Watershed consisting of local residents submitted an application for watershed assistance to the Nebraska Soil and Water Conservation Commission on March 25, 1965. A field examination of Long Branch Watershed was conducted on May 6, 1965, at the request of the Nebraska Soil and Water Conservation Commission. A public meeting was held in Auburn, Nebraska, during which results of the field examination (which confirmed statements made in the application) were discussed and a decision was made to organize the Long Branch Watershed Conservancy District pending application approval by the State Commission. The State Commission approved the application on May 27, 1965, and issued a planning priority for Long Branch Watershed.

During the preliminary investigation stage,which was conducted by the Soil Conservation Service with assistance of local residents, the Soil Conservation Service met periodically with the sponsors at official meetings that were advertised and open to the public in order to make progress reports. During this stage the sponsors stated their primary objectives and various alternative solutions were considered. A preliminary investigation report prepared by the Soil Conservation Service was tentatively accepted and it was agreed to make specific investigations during planning. The preliminary investigation report and request for planning authority were then submitted to the Washington office of the Soil Conservation Service.

When planning was authorized by the Soil Conservation Service Administrator in May 1971, sponsoring local organization, state agencies, and federal agencies were so informed and were invited to furnish the Soil Conservation Service with any information or suggestions that would be of assistance in developing a work plan. During planning Soil Conservation Service personnel met with the sponsoring local organization at advertised (via press and radio) public and regular monthly meetings to report on watershed investigations, to elicit opinions of local people, and to report on planning progress. Public agencies were also invited to attend these meetings. Several alternative solutions were considered and at a regular meeting on February 27, 1973, the sponsoring local organization agreed to tentatively accept a proposed structural system and scheduled a public meeting.

The public meeting was held on April 24, 1973, with an estimated 55 people in attendance. Prior to the meeting all known interested public agencies were notified of the meeting and were requested to participate in the meeting if they so desired. Local newspapers and radio were utilized to inform local people of the pending meeting and to invite them to attend. At the

public meeting conducted by the sponsoring local organization all people requesting an opportunity to testify were given an opportunity. Based on testimony presented at the public meeting; information presented by local, state, and federal agencies; and desires of the sponsoring local organization, a project was then formulated. During development of the work plan the Nemaha Natural Resources District replaced the Long Branch Watershed Conservancy District and four Soil and Water Conservation Districts as sponsors. During the same period the Nebraska Soil and Water Conservation Commission became the Nebraska Natural Resources Commission.

GOALS

The primary goals of the Sponsoring Local Organization and the Service in developing this project plan are to help meet man's requirements for goods and services while the natural environment is maintained in a quality condition.

In order to meet these goals, the Sponsoring Local Organization believes the following goals must be accomplished:

Watershed Protection (Conservation Land Treatment)

Install additional land treatment in order to obtain 75 percent of the needed land treatment within the watershed within the next eight years to reduce soil losses to or below the maximum allowable soil loss of 5 tons per acre, the rate at which the level of fertility can be maintained by offsetting soil losses with practices that increase fertility. Fifty percent of planned land treatment measures have presently been applied and seventy-four percent or 199 basic conservation plans have been written for cooperators in the watershed. The principal practices needed include the following: Conservation Cropping Systems, Contour Farming, Terraces, Waterways, Erosion Control Structures, Proper Grazing, Deferred Grazing, Pasture Seeding, Pasture Management, Livestock Ponds, Critical Area Plantings, and Farmstead Windbreaks.

To realize the maximum returns consistent with forest sites capabilities, fire protection, grazing control, forestation, and improved forestry practices measures are needed.

Studies of past achievements of cooperators in the watershed indicate that proposed land treatment goals can be accomplished during the 8-year project installation period.

Flood Prevention

Within the various flood plain components it will be necessary to approximate the following damage reductions to achieve a desirable level of protection.

1. Cropland. 1/ Cropland areas of significance are located in all stream

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1/ Refer to page 20 for acres and damages and to the project map (Figure 6) for locations of areas.

reaches. The sponsoring local organization's goal is to achieve a 65 percent reduction in average annual damages in these areas.

2. Pasture. 1/ Pastureland totals about 12 percent of the flood plain area. The sponsoring local organization felt that pasture damages were moderate in nature and extent and a specific goal for damage reduction was not set.

3. Sediment and Scour. 1/ The sponsoring local organization's goal is to achieve a level of protection that will prevent the gradual acceleration of present sediment and scour damages and reduce the present rate of damage by about 65 percent.

Grade Stabilization

Structural control is needed on a sufficient number of gullied areas to allow for land treatment measures to be installed and maintained on at least 75 percent of the affected areas. A 60 percent reduction in sediment yields from these areas is also a part of the overall grade stabilization goal. Twenty critical gully erosion areas affecting the installation of land treatment measures on about 4,000 acres exist within the watershed.

Recreation

1. Create a lake with a surface area of approximately 160 acres near the city of Humboldt.

2. Install facilities near the city of Humboldt to provide about 25,200 recreation visits annually. Goals for a Sunday peak use day, without turnover, will approximate: boating, 105; picnicking, 240; fishing, 90; and nature walks, 25. The 125 parking spaces will be adequate to provide for a peak use day design capacity of about 480 people.

ENVIRONMENTAL CONSIDERATIONS

Consideration was given in the development of this plan to preserve, protect, and improve fish and wildlife resources and to preserve, protect, and improve the quality of land, water, and living conditions within the watershed and the region. It was determined that an economical plan could not be developed without some disturbance of wildlife habitat and that habitat destroyed would be replaced. The relocation of one farmstead will be necessary.

The sponsoring local organization assures that comparable replacement dwellings will be available for persons displaced from dwellings. The sponsoring local organization will give relocation assistance, make relocation payments to displaced persons, and otherwise comply with regulations as set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective January 2, 1971.

1/ Refer to page 20 for acres and damages and to the project map (Figure 6) for locations of areas.

The Nebraska Game and Parks Commission was consulted regarding possible effect of the project on rare and endangered wildlife and plants. They have reported that they do not expect any effect on either.

The sponsoring local organization wishes to enhance the aesthetics of the watershed as well as improve wildlife habitat; consequently, the plan calls for the establishment of woody vegetation in vicinities of structural sites. Land treatment will preserve and improve fish and wildlife resources.

ALTERNATIVES

Various alternatives to the proposed project action were considered. These alternatives included:

1. Accelerated land treatment along.

2. Accelerated land treatment supplemented by nonstructural measures - conversion of flood plain cropland to noncrop uses.

3. Elimination of the project recreational development and the accelerated land treatment program.

4. No Project - including on-going land treatment program.

The ideal solution to problems may well be the use of several alternatives in the optimum combination; however, each alternative and it's impact will be discussed as a separate and lone alternative.

1. This alternative would consist of the accelerated application of land treatment measures on 7,800 acres of cropland, 3,070 acres of pasture, 3,000 acres of woodlands, and the conversion of 2,270 acres of cropland to pastureland. The accelerated land treatment program would reduce the soil loss to the acceptable goal of 5 tons/acre/year. The application of land treatment measures would provide long range additional wildlife habitat and would reduce sheet and rill erosion about 17 percent. The land and forestry treatment measures would improve the visual environmental setting and economic returns to landowners would improve with improved management practices. Land treatment measures would reduce the present flood plain crop and pasture damages an estimated 4 percent. The nation's demand for food and fiber, as well as the economics to the resident farmers, rules out any large scale conversion of cropland to pastureland. Also, a 4 percent reduction in flood plain crop and pasture damages would be insignificant. Total cost of this alternative is approximately $400,000.

2. This alternative includes the land treatment program of alternative 1 and the conversion of flood plain land from cropland with high potential for damages to grassland or woodland with lesser potential for damages. Such conversions in lieu of the planned project would require monetary compensation to landowners whose farming enterprises are presently geared to crop production on flood plain lands. This plan would cost the community about $319,000 annually, eliminate an annual net income

of $161,000 to 147 farms, reduce the production of food and fiber to the economy, forego waterbased recreational benefits from structures, and forego beneficial effects from reduced sediment to the stream system. One advantage of this alternative would be the improvement of wildlife habitat in the flood plain. Some other advantages are landbased recreational use, pollution control, grazing use, hay production, and erosion control.

3. The exclusion of the recreational development from the selected plan would result in a reduction of about $122,220 in construction costs for facilities, about 100 acres less land devoted to the recreation pool, and about 275 acres less of land devoted to recreational development. The average annual recreation benefits of $56,700 would also be eliminated as well as the benefits to be derived from the land treatment program. An estimated 25,200 recreation visits would be lost annually in an area that is presently experiencing recreational deficiencies of about 2,800 acres of recreational land, 800 acres of picnic areas, and 600 acres of campgrounds.

4. This alternative, which has been in existence up to the present, is the absence of any project to solve existing flood and gully problems. Such an alternative would permit problems, too costly for individual operators to solve, to continue without solution and would forego the development of waterbased public recreation. Under this alternative the flooding, sedimentation, and gully deterioration would continue and accelerate. The "no project" alternative would forego $340,640 in average annual benefits and save $164,410 in average annual cost, thus foregoing net benefits of $176,230 annually (Table 6).

   Advantages of the alternative of no program are that 532 acres devoted to structures and their sediment pools would not be needed for this purpose, the cost of operation and maintenance would not be needed, the temporary loss of certain wildlife habitat would be avoided, and the inconvenience of construction would be avoided.

WORKS OF IMPROVEMENT TO BE INSTALLED

LAND TREATMENT MEASURES

Cropland treatment will require a combination of one or more of the following practices: Conservation Cropping System, Contour Farming, Terraces, Waterways, Erosion Control Structures, Proper Grazing, Deferred Grazing, Pasture Seeding, Pasture Management, Livestock Ponds, Critical Area Plantings, and Farmstead Windbreaks. Alternative combinations of land treatment measures are provided for in the SCS Field Office Technical Guides. Land capability class I might require only a conservation cropping system. Land capability calsses II, III, and IV will require, in addition to this, contour farming, grassed waterways, and terraces. Under certain field conditions field border plantings, diversions, and grade stabilization structures may be required for adequate land treatment. Alternative uses for land capability classes I through IV may include a change to less intensive use such as pastureland.

Pastureland treatment will include pasture management. In addition, such practices as farm ponds, grassed waterways, and terraces may be installed.

Other land treatment will include critical area planting and wildlife habitat development.

Woodlands contribute most to environmental quality and produce satisfactory economic returns when tree stands are protected, fully stocked, and vigorous. To attain these objectives the following land treatment measures are included: grazing control, 1,300 acres; continued fire protection, forestation, 40 acres; and improved forestry practices, 250 acres. Technical assistance will continue to be provided to rural fire districts through the regular fire control technical assistance program.

Approximately 60 percent of the soil surveys have been completed in this watershed. The remaining surveys will require 1,000 man-hours of technical assistance.

At present, 50 percent of the required land treatment has been applied and a minimum of 75 percent of the needed land treatment will have been installed within Long Branch Watershed prior to or concurrent with construction of structural measures. It will require 11,400 man-hours of technical assistance to install these additional land treatment measures. The remaining area will receive partial land treatment or management practices.

NONSTRUCTURAL MEASURES

Land use regulations in the city of Humboldt meet the requirements of the National Flood Insurance Program as outlined in the emergency phase requirements of the 1973 Disaster Protection Act. These regulations will remain in effect until implementation of the State of Nebraska zoning laws. At

that time all urban and rural areas within the 100-year flood plain will be zoned to prevent any further residential or commercial development.

STRUCTURAL MEASURES

A system of 12 floodwater retarding structures, 1 multiple-purpose floodwater retarding structure with recreation facilities, and 12 grade stabilization structures will be installed at locations indicated on the project map (Figure 6). The system of floodwater retarding structures will control runoff from 31.26 square miles which is approximately 43 percent of the total drainage area of the watershed.

Those structures for which data is shown in Table 3 will have an aggregate storage capacity of 5,958 acre-feet for floodwater and 1,636 acre-feet for sediment. In addition, those grade stabilization structures shown on Table 3A will store a total of 359 acre-feet of sediment.

The emergency spillway for each structure will be excavated in earth abutments and will be vegetated. Material removed in emergency spillway excavation plus borrow from conservation pools and adjacent areas will provide adequate embankment material for all structures.

All structures will have single-stage principal spillways except site 61 which will have a two-stage inlet structure. The principal spillway components will be constructed of reinforced concrete for all those structures listed in Table 3. The principal spillway components for those structures shown in Table 3A will be constructed of corrugated metal with appropriate cathodic protection devices. All structures will initially retain water at their riser crests and all have been designed to contain a 50-year accumulation of sediment. The percent chance use of the emergency spillways varies among the several sites in accordance with the applicable hydrologic criteria for the structure class and purpose (See Tables 3 and 3A for individual structure data).

Borrow areas resulting from construction of the dams shall be located where they will be permanently inundated, if possible. Borrow areas located in the normal summer flucuation zone or outside the reservoir basin will be made self draining.

All depressions which will be flooded by the reservoir at maximum pool levels and which will retain water at lower pool levels will be connected with the reservoir, wherever possible, by drains to insure complete drainage, or flucuation of water within the depression.

The installation of site 70 will require the closure of the north - south road immediately upstream from the site. About 600 feet of the east - west road above site 7 will be built up a maximum of 5 feet. At site 21, the east - west road on the north side of section 31 will be closed. Also, the north - south road on the east side of section 31 will be officially closed. This road is not in use presently, since there is no bridge over Kirkham Creek. The intersection at the southwest corner of section 29 will be

rounded slightly so that roads to the east and north of the intersection can remain open. The two natural gas pipelines (6" and 16") which cross the upstream end of the flood pool at site 2 will be encased in concrete to prevent any possible leakage or flotation during periods of inundation. The proposed alteration will involve about 300 feet of each line or a total of 600 feet of concrete encasement. The installation of site 21 will require relocation of approximately 3/4 of a mile of rural water district pipeline. Some minor changes to utilities may be required at several locations. After relocation the structure will not affect the pipeline.

Site 21 will be a multiple-purpose floodwater retarding and recreation structure. The surface area of the proposed recreation pool will be 159 acres. The initial storage available at the riser crest is 1,686 acre-feet. The expected accumulation of submerged sediment over the evaluation period is 211 acre-feet leaving a total of 1,475 acre-feet of recreation water available. One farmstead is located within the flood pool and purchase boundary of site 21 and relocation will be necessary.

The recreation facilities to be constructed adjacent to site 21 will be located in 6 areas as shown in Figure 5 and Table 2B. Area I is intended to be primarily a picnic area with a fishing dock. Area II will be a day use area which will be used for picnics and field sports, and Area III is planned as a boat launch. Areas IV and V will be for fishing access and a nature trail will be constructed in Area VI. All sanitary facilities will be of masonry construction and along with the fishing dock will be designed for access and use by the physically handicapped. It is expected that drinking water for all such developments will be obtained from a rural water district pipeline.

The land to be used for installation of site 21 and adjacent recreation facilities will be purchased in fee title and will total approximately 460 acres. An additional 4.5 acres of flowage easement will be required. The area of the recreation pool totals 159 acres and the area of the retarding pool is about 265 acres. The remaining 195 acres will be available for the facilities and additional public use.

A study of the planned or incidental recreation potential and the need for public access was made for each site in the watershed.

The need for public recreation areas within the watershed was recognized by the sponsoring local organization. Site 21 was selected for recreational development. The structure was increased in size to provide a recreation pool of 159 surface acres.

Structure P-8, 1-1, N-1, N-5, N-7, R-3, R-11, R-15, P-4A, P-4B, 7, and 42 will have surface areas varying from 1.8 to 9.0 acres. It was determined that because of small surface areas and shallow water levels these structures would offer little in the way of public fishing or recreational opportunities. Based on existing landowner response, sponsors have agreed that public access will not be furnished for these structures. However, it is understood that should any of these structures be opened for public access, installation of sanitary facilities must be provided to comply with Nebraska health laws.

The remaining structures can provide incidental recreational benefits such as boating and fishing. The sponsors have agreed to prohibit or discourage such use since they are providing site 21 for public use and do not have adequate funds to install the needed sanitary facilities at any additional site areas. Planned or incidental recreational benefits were not used for economic justification of any structures other than site 21.

During construction of this project, contractors will be required to follow strict guidelines pertaining to air and water pollution. Air pollution guidelines are presently being developed in Nebraska that contractors will be required to adhere to. Guidelines for water pollution reduction during construction include construction of principal spillway prior to removing vegetation in other areas, selective borrow pit openings, and construction of diversions above emergency spillway areas.

The archeological, historical, and architectural survey indicates that the project measures will not affect any archeological sites. No historic sites, historic buildings, and buildings of architectural significance will be affected by construction of, or inundation by, project measures. 1/

Consultation with the State Historic Preservation Officer and the latest available monthly supplement to the National Register of Historic Places indicates that no National Register property will be affected by the proposed structural measures.

The National Park Service and the Nebraska State Historic Preservation Officer will be notified if any previously unidentified evidence of cultural values are discovered during detailed investigations or construction and that the procedures in the National Historic Preservation Act (Section 106, PL 89-665, 16 USC 470(F)) and Executive Order 11593 (Section 1(3)), will be adhered to.

A field investigation was made of all proposed structural measures in December 1972. The Soil Conservation Service planning personnel and biologists with the U. S. Fish and Wildlife Service and the Nebraska Game and Parks Commission were active participants in these investigations. Each structure was reviewed for the quality of habitat expected to be destroyed by inundation and construction of the structural measures. Habitat conditions were evaluated in accordance with the joint Fish and Wildlife Service and Soil Conservation Service habitat evaluation criteria. The table on page 34 lists, by structure, the acreage required for intensive habitat management to mitigate habitat losses. A total of 69 acres of wildlife plantings will be established and protected to exclude livestock use to mitigate the loss of wildlife habitat by project construction. These investigations are a part of the cooperative working relationship between the interested agencies and also serve to meet the requirements set forth under the Fish and Wildlife Coordination Act (P.L. 85-624).

Geologic investigations, surface and/or subsurface, during the planning stages were conducted of the dam sites, borrow, conservation pool, and flood pool

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1/ Prehistoric and Historic Resources Report, November 1974, by the Department of Anthropology, University of Nebraska-Lincoln.

areas. These investigations indicated that the project measures would have no adverse effect on known mineral resources or mineral operations, nor would it significantly hamper the future exploration or production of petroleum.

LONG BRANCH WATERSHED, NEBRASKA

Mitigation Summary 1/

Structure No.	Site 2/ Acres	Woods Acres	Woods Mitigation Factor	Woods Mitigation Acres	Woody Pasture Acres	Woody Pasture Mitigation Factor	Woody Pasture Mitigation Acres	Total Mitigation Acres
2	29.2	2.0	.3	.60	10.0	.3	3.00	3.60
3	16.2	6.7	.3	2.00	-	-	-	2.00
4	18.2	9.7	.3	2.90	-	-	-	2.90
7	19.2	5.0	.3	1.50	10.0	.1	1.00	2.50
21	181.0	10.0	.7	7.00	38.0	.3	11.40	18.40
41	30.0	7.0	.6	4.20	2.0	.5	1.00	5.20
42	13.0	7.7	.2	1.50	3.5	.1	.35	1.85
61	16.5	-	-	-	12.0	.2	2.40	2.40
70	19.2	9.0	.4	3.60	4.1	.1	.40	4.00
71	28.3	9.4	.6	5.60	7.2	.4	2.90	8.50
73	20.2	13.0	.3	3.90	-	-	-	3.90
77	14.1	3.5	.3	1.10	3.4	.3	1.00	2.10
91	16.1	-	-	-	5.7	.3	1.70	1.70
1-1	4.1	1.1	.5	.60	-	-	-	.60
N-1	8.5	-	-	-	2.0	.1	.20	.20
N-5	11.0	-	-	-	7.8	.1	.78	.78
N-6	16.0	3.5	.3	1.10	2.5	.2	.50	1.60
N-7	6.6	-	-	-	-	-	-	-
P-3	13.6	4.3	.3	1.30	3.0	.2	.60	1.90
P-4-A	12.2	-	-	-	6.2	.1	.62	.62
P-4-B	10.2	-	-	-	-	-	-	-
P-8	9.6	1.0	.5	.50	-	-	-	.50
R-3	13.0	0.5	.4	.20	2.0	.2	.40	.60
R-11	9.6	4.1	.7	2.90	-	-	-	2.90
R-15	6.7	-	-	-	2.0	.3	.60	.60
TOTAL	542.3	97.5		40.50	121.4		28.85	69.35

1/ Developed from preliminary data furnished by Bureau of Sports Fisheries and Wildlife on December 7, 1972, after a joint field review with Soil Conservation Service and Nebraska Game and Parks Commission personnel on November 27 and 28, 1972.

2/ Dam, spillway, and sediment pool.

EXPLANATION OF INSTALLATION COSTS

LAND TREATMENT MEASURES

Estimated project installation costs for land treatment are $445,100. These costs will be borne by other funds, $423,100 and P.L.-566, $22,000. Estimated cost is based on experience of landowners and operators in applying land treatment measures. They include value of cost-sharing assistance to be received under other programs. Technical assistance costs are estimated at $93,300. These are divided into Soil Conservation Service, $78,300 and Forest Service, $15,000. The Soil Conservation Service's technical assistance costs of $10,000 will be furnished by P.L.-566 funds to provide for completion of standard soil surveys in Johnson and Nemaha counties.

Cost of forest land treatment will be $12,300 to be borne by landowners through cost-sharing programs authorized by the Clarke-McNary Act or other available programs. The estimated cost of fire control measures is $40,000 to be borne by ongoing Cooperative Fire Control Programs in cooperation with the rural fire districts. Technical assistance costs will be $15,000 to be shared by P.L.-566, $12,000; the Nebraska State and Extension Forester, $2,750; and contributions from ongoing forestry programs, $250 (See Table 1). 1/

STRUCTURAL MEASURES

Total cost of structural measures is $2,456,920. P.L.-566 will furnish $2,025,970 and other funds will furnish $430,950. Cost of wildlife plantings are included under construction costs and are allocated in the same manner as are construction costs.

P.L.-566 costs are divided into construction, $1,517,730 (100 percent of construction costs allocated to floodwater and 50 percent of construction costs allocated to recreation); engineering, $138,990 (100 percent of engineering costs of 25 structures and 50 percent of the Architecture and Engineering contract); land rights, $98,500 (50 percent of land acquisition costs of site 21 and recreation facilities at site 21); relocation costs, $6,600 (70.5 percent of relocation payment); and project administration, $264,150. Project administration includes costs of contract administration, construction surveys, and construction inspections.

Other costs include land rights, $296,000 (100 percent of land rights costs of 12 grade stabilization structures and 12 floodwater retarding structures; 50 percent of land acquisition costs of site 21 and the recreation facilities at site 21; and 100 percent of costs of flowage easements, survey costs, and legal fees associated with site 21); engineering, $9,170 (50 percent of Architecture and Engineering contract); construction, $113,750 (50 percent of construction costs allocated to recreation for site 21 and for the

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1/ Forestry Work Plan by U. S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

recreation facilities at site 21); and project administration, $9,270 (includes overhead and administration expenses incurred by sponsors during the installation of project measures); and relocation costs, $2,760 (29.5 percent of relocation payment). All legal fees and survey costs associated with land rights are included in other costs. Relocation costs are applicable to persons, business, and farm operations displaced as a result of structural measures.

The land rights costs include $2,000 for rerouting a road at site 21.

Engineering services associated with the recreation facilities at site 21 will be provided by a cost shared engineering contract.

A 10 percent contingency allowance was included in the construction cost estimates.

Construction costs for site 21 were allocated according to the "Use of Facilities" method. The total storage of the structure will be about 3,800 acre-feet. The structure will store about 1,475 acre-feet of recreation water or about 38.8 percent of total storage. The remaining 61.2 percent was allocated to flood prevention.

Engineering costs for site 21 were allocated in the same proportions as the construction costs. Of the $198,100 land rights costs for structure 21 a flowage easement of $600 was allocated to flood prevention. The remainder of $197,500 was allocated, 38.8 percent to recreation and 61.2 percent to flood prevention.

It was planned that 460 acres of fee simple land would be purchased for the multi-purpose structure, the recreational facilities, and for the structure and spillway site. The total cost of the 460 acres of land was $184,000. Out of the 460 acres, 18 acres are needed for the structure and spillway, 40 acres for the sediment pool, 119 acres for the recreation pool, 106 acres for the flood pool, and the balance for recreation facilities.

One farmstead and family will need to be relocated, for which $9,360 in relocation payments is provided for replacement housing. Relocation assistance advisory services of $800 will be provided to assist in moving and related expenses for the displaced family.

Costs of the 12 grade stabilization structures and the 12 floodwater retarding structures were allocated to floodwater and the costs of the recreation facilities at site 21 were allocated to recreation. Table 2A shows the cost allocation for structural measures.

Estimated Obligations by Fiscal Year
During the Installation Period

Fiscal Year	Land Treatment Costs: P.L.-566 Funds	Land Treatment Costs: Other Funds	Structural Measure Costs: P.L.-566 Funds	Structural Measure Costs: Other Funds
First Year	$ 1,800	$ 57,000	$ 225,100	$ 33,900
Second Year	2,800	68,000	275,100	38,400

Estimated Obligations by Fiscal Year
During the Installation Period
(Continued)

Fiscal Year	Land Treatment Costs: P.L.-566 Funds	Land Treatment Costs: Other Funds	Structural Measure Costs: P.L.-566 Funds	Structural Measure Costs: Other Funds
Third Year	$ 3,700	$ 68,000	$ 181,100	$ 22,000
Fourth Year	3,700	63,000	213,000	22,900
Fifth Year	3,700	57,000	179,200	17,500
Sixth Year	2,800	46,000	230,600	28,500
Seventh Year	1,800	29,000	239,600	37,500
Eighth Year	1,700	35,100	475,270	230,250
TOTAL	$22,000	$423,100 1/	$2,025,970	$430,950

1/ Includes $55,300 Forest Service funds, $3,000 of which is for Technical Assistance. Also includes $68,300 of Technical Assistance from SCS.

Wildlife habitat plantings unavoidably destroyed during the installation of this project will be mitigated by planting 69 acres of habitat. Such plantings will be on land provided through easement or purchase by the sponsors except that portion resulting from construction of site 21 which will be planted on land purchased through cost share for recreational facilities.

Installation cost of wildlife habitat plantings will be provided by P.L.-566 funds except for those plantings resulting from construction of site 21 where other funds will share the cost on the basis of the cost share for constructing the structure. The cost for specifications of such plantings will be provided by P.L.-566 funds. All costs for these plantings are included in the total cost of Table 2.

EFFECTS OF WORKS OF IMPROVEMENT

FLOOD PREVENTION, EROSION, AND SEDIMENT

Application of land treatment measures will benefit all farms in the water shed. Long range benefits will accrue to fish and wildlife through the application of field border plantings, grassed waterways, grass seeding, critical area plantings, wildlife habitat development and reduction of sediment. Upland sheet and rill erosion will be reduced 21 percent as a result of additional land treatment. With the project in place, sheet, rill, gully, and streambank erosion sediment yields to the mouth of the watershed will be reduced from 137,800 tons/year to 67,900 tons/year or 51 percent.

The forest land treatment program will make the woodlands more effective in handling water and reducing the effects of erosion.

The forestry treatment measures will maintain and improve the ability of woodlands to control runoff and reduce soil losses. Economic returns to landowners will improve as improved methods are put into practice. Tree planting to enhance the recreation quality of the watershed is needed and will be of great benefit to many families of the community.

The watershed area is protected by rural fire districts. Equipment procurement, fire training, and fire prevention education will be continued and upgraded through the Cooperative Fire Control Program. 1/

Approximately 25,700 acres of land will receive benefits from the structural measures constructed in Long Branch Watershed. This includes 5,670 acres in the watershed and over 20,000 acres in downstream areas of the Lower Big Nemaha River and the South Fork Big Nemaha River. Of the 5,670 acres benefitted in the watershed, 2,570 acres are in the 100-year flood plain below the structures and 3,100 acres stabilized above the grade stabilization structures. Based on the average size farm of 315 acres, this would benefit the equivalent of at least 80 average size farms. These average annual direct benefits would total $253,180.

In addition, the recreational structure is estimated to provide $56,700 of recreational benefits from 25,200 visitor days annually. The people served are in the Beatrice socioeconomic area which includes parts of Gage, Jefferson, Pawnee, Richardson and Thayer Counties. The estimated population residing within a 30-mile radius of the recreational structure numbers nearly 34,000 people.

Although no recreational benefits were claimed regarding the 12 floodwater retarding structure sites and the 12 grade stabilization structures, some sites can provide fishing and boating. The recreation potential is discussed on page 31. Water quality is expected to be adequate for such

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1/ Forestry Work Plan by U.S. Forest Service in cooperation with and through the Nebraska State and Extension Forester.

incidental use but sponsors are aware that such use could result in the need for installation of sanitary facilities. The sponsors will discourage such use since they are providing site 21 for public use and do not have adequate funds for such facilities at other locations.

Project effects on reduction of floodwater discharge and area flooded are as follows:

Reach	Flood Frequency	Without Project		With Project	
		Discharge (cfs)	Area (Acres)	Discharge (cfs)	Area (Acres)
I	100-year	19,250	182	9,360	75
	10-year	11,160	146	6,140	0
	5-year	8,840	54	5,030	0
	2-year	6,075	0	3,360	0
II	100-year	19,000	308	9,345	208
	10-year	10,950	247	6,135	43
	5-year	8,680	191	5,015	14
	2-year	6,020	38	3,335	4
III	100-year	14,230	1,408	8,650	1,251
	10-year	8,330	1,230	5,555	987
	5-year	7,160	1,114	4,445	782
	2-year	4,580	813	2,860	352
IV	100-year	7,745	346	3,995	171
	10-year	4,490	242	2,390	94
	5-year	3,460	166	1,820	66
	2-year	2,340	91	1,115	20
V	100-year	6,575	325	385	224
	10-year	3,870	138	205	71
	5-year	2,950	69	156	44
	2-year	1,795	28	96	28
TOTAL	100-year	---	2,569	---	1,929
	10-year	---	2,003	---	1,195
	5-year	---	1,594	---	906
	2-year	---	970	---	404

An estimated 1,594 acres of land would be inundated by a (5-year) 20 percent chance storm event under present conditions. A storm of this same magnitude will inundate an estimated 906 acres when the proposed measures have been installed. If flooding is expressed in average annual acres, the completion of the project will decrease flooding from 1,617 to 617 average annual acres.

Reaches I, II, III, and IV are located on Long Branch Creek and Reach V is part of Kirkham Creek. Only the lower portion of Reach V receives floodwater damage reduction due to site 21 being located towards the lower end of the reach.

A 100 percent chance of beginning flooding implies that a stream will probably reach or exceed bankfull capacity at least once annually. A 200 percent chance of beginning flooding means that on an average a stream will reach bankfull capacity twice annually. A 25 percent chance of beginning flooding means a stream will run at full capacity once in 4 years.

In Reach I the present percent chance of beginning flooding is 32 percent versus a 4 percent chance of beginning flooding with project. A 97 percent reduction in floodwater damages is expected in this reach. Urban damage presently begins with a 4 percent chance storm. No urban damage will occur from a 1 percent chance storm with project.

In Reach II the percent chance of beginning flooding is presently 290 percent which will be reduced to 75 percent with project. An 84 percent reduction in floodwater damages is expected.

In Reach III the major portion of the crop and pasture damages occur with present percent chance of beginning flooding being 300 percent. With project a 136 percent chance of beginning flooding and a floodwater damage reduction of 63 percent is expected.

In Reach IV the percent chance of beginning flooding will be reduced from 239 to 91 percent. A floodwater damage reduction of 76 percent is expected.

In Reach V only the lower portion of the reach is affected by the project. The present percent chance of beginning flooding below the structure is 26 percent being reduced to near zero percent. A reduction in floodwater damages approaching 100 percent is expected.

Of the total crop and pasture damage reduction within Long Branch Watershed, 77 percent occurs in Reach III. Within this reach a 63 percent damage reduction is expected to occur.

Reaches I and V contribute only 4 percent of the total crop and pasture damage reduction in the watershed. However, within the two reaches the flood damage is reduced by 42 percent.

Reaches II and IV have crop and pasture damage reductions of 8 percent and 11 percent respectively of the total crop and pasture reduction. The damage reductions within each reach are 84 percent and 76 percent respectively of the damages under present conditions.

Flood Plain Benefits With Project Installation

Reach	I	II	III	IV	V	Total
Acres Flooded (Crop and Pasture) by Flood Frequency						
2	0	4	352	20	28	404
5	0	14	782	66	44	906
10	0	43	987	94	71	1,195
100	75	208	1,251	171	224	1,929

Flood Plain Benefits With Project Installation
(continued)

Reach	I	II	III	IV	V	Total
Dollar Damages (Crop and Pasture) by Flood Frequency						
2	0	126	11,558	529	1,145	13,358
5	0	785	28,804	2,425	2,072	34,086
10	0	1,763	39,017	3,863	3,103	47,746
100	1,764	7,324	60,073	7,735	8,962	85,858
Dollar Benefits (Crop and Pasture) by Flood Frequency						
2	0	1,553	18,103	2,927	0	22,583
5	1,272	5,802	19,089	4,467	483	31,113
10	5,824	8,079	19,014	6,688	2,175	41,780
100	8,905	7,420	18,229	10,282	4,925	49,761
Sediment and Scour Damages (Av.Ann.)						
Dollars	22	86	275	110	11	504
Sediment and Scour Benefits (Av.Ann.)						
Dollars	137	512	1,646	482	58	2,835
Urban						
Dollars (Av.Ann.)	380					380

No significant land use changes are expected to occur as a result of project measures. Flooding will be reduced, but the level of protection planned for the flood plain is not sufficient to warrant more intensive land use than is presently practiced.

Within the Long Branch Watershed in the areas affected by the structural system construction of the project will result in a 65 percent decrease in agricultural damages and a 67 percent decrease in nonagricultural damages. Indirect damages will be reduced 66 percent. The total damages will be reduced 74 percent.

Average annual flooding will be reduced on about 1,000 acres, thus, reducing the potential for development of mosquito breeding areas in depressions or other nondraining areas situated in the flood plain.

It is presently estimated that 187 acres have suffered a loss of production due to sediment and scour damages. This loss of production ranges from 12 to 20 percent for an average loss of 19 percent. Without project this loss is projected to increase to 20 to 30 percent with an average loss of 29 percent. With the installation of the project the projected increase in damages

is prevented and the present damage is reduced 69 to 93 percent or an average of about 84 percent. Land treatment itself will reduce the present damages an estimated 4 percent.

Sheet and gully erosion within the watershed will be reduced approximately 21 percent with the installation of land treatment measures. Average soil losses of 14 tons/acre/year from cropland and average soil losses of 5.5 tons/acre/year from pastureland will be reduced to or below the maximum allowable soil loss of 5.0 tons/acre/year with the application of needed conservation measures. The grade stabilization structural measures will reduce gully erosion from critical sediment source areas by 78 percent, or from 34,500 tons/year to 7,500 tons/year. Sheet and gully erosion yields to the Long Branch channel will be reduced from 212,000 tons/year to 104,400 tons/year or 51 percent with project installation.

Grade stabilization structures will prevent the loss of an estimated 83 acres or 1.6 acres per year that would be voided by advancing gullies. An additional 4,000 acres whose use is being restricted due to the presence of unstable grades will benefit from the construction of grade stabilization structures. Such structures will permit the installation of certain land treatment practices on areas adjacent to gullies which will permit more intensive cultivation while still maintaining an acceptable soil loss.

Downstream sediment damages will be reduced approximately 51 percent or from 137,800 to 67,900 tons per year. This reduction is accounted for by an overall reduction in sheet erosion of 50 percent, 57,900 to 29,000 tons per year, and a 51 percent reduction in gully erosion, 78,900 to 38,900 tons per year.

Nemaha River pollution as related to sediment concentrations will be reduced 69,000 tons per year or from an average daily concentration of 375 to 110 tons per day. This reduction relates specifically to storms of high intensity and runoff where a major portion of the average annual sediment yield is produced from one storm.

The city of Humboldt presently experiences no significant flood damage except during high frequency storms. No damage occurs at the 10-year frequency storm and only 2 basements are flooded at the 25-year storm. Significant flooding occurs at the 50- and 100-year intensity storms. After project installation no damage will occur from the 100-year frequency storm and the flood stage will be 2 feet lower than present.

Works of improvement in the Long Branch Watershed will reduce damages downstream on the Big Nemaha flood plain. The proposed floodwater retarding structures in the watershed will control about 1-1/2 percent of the Big Nemaha Basin's drainage area.

The flood retarding structural system planned for Long Branch Watershed will place over 43 percent of the watershed area above structures. The average annual flood reduction benefit downstream in the Big Nemaha River flood plain is estimated to be $121,080 with 75 percent of this being crop and pasture benefits. Long Branch Watershed is only one of several watersheds draining

into the Big Nemaha River and the damage reduction resulting from the Long Branch Watershed is about 16 percent of the estimated total flood damages without project.

FISH AND WILDLIFE AND RECREATION

Approximately 426 acres of water will be created initially by the installation of all structural measures and 159 acres (at site 21) will remain after the project evaluation period. The total area to be occupied by dams, emergency spillways, sediment pools, and the recreation pool is about 542 acres. An additional 532 acres will be subject to infrequent inundation by flood pools. The following table identifies the land use by areas to be affected.

ALL STRUCTURES	CHANNEL ACRES	WOODS ACRES	WOODY PAST. ACRES	OPEN PAST. ACRES	CROP ACRES	MISC. ACRES	TOTAL ACRES
Dam & Spillway	3.8	19.9	20.9	21.4	43.2	-	109.2
Permanent Pool	57.9	77.6	100.5	68.6	122.9	5.6	433.1 1/
Flood Pool	37.2	39.3	106.2	95.3	246.2	8.1	532.3

1/ Includes total sediment pool of 15 acres on structure 7 although only an 8 acre pool will be created initially.

As can be seen from the table above, approximately 219 acres of woodland and wooded pastureland will be occupied by dams, emergency spillways, and sediment pools. This wildlife habitat of varying quality will be mitigated by the planting of at least 69 acres of high quality habitat within the watershed.

The installation of the dams and their resulting sediment pools will change characteristics on approximately 20.5 miles of stream channels classified as having "E", or ephemeral flows, 1.3 miles having "I", or intermittent flows, and 2.3 miles having "Pr", or perennial flows. The flood pools of the structures will infrequently inundate about 13 miles of channel having "E" flows and 1.1 miles of channel with "Pr" flows.

Ephemeral stream channels flow only during periods of surface runoff. Intermittent stream channels have continuous flow through some seasons of the year but little or no flow through other seasons. Perennial stream channels have flows at all times except during extreme drought.

Recreational structure 21 will provide 159 acres of recreation water plus 300 acres of developed and undeveloped land to which the public will have access. This will significantly reduce the deficiency of recreational land and water in the Beatrice Socioeconomic area in which the structure is located. The water surface plus approximately 6.6 miles of shoreline which will be created will provide 90 fishing opportunities per day. A 5,000 foot nature trail will be provided which will furnish 25 recreational opportunities per day.

The 125 parking spaces will be adequate to provide for a peak use day design capacity of about 480 people. The estimated recreational season is 70 weekdays and 28 weekend days.

With project a total of 433.1 acres of surface water will be created. Evaporation and seepage losses on these impoundments will result in a depletion of approximately 450 acre-feet per year.

Land under adequate conservation treatment presently represents approximately 75 to 80 percent of the land, and under project conditions this percent is expected to range from 80 to 90 percent. Therefore, no significant effect on present surface supply of water is anticipated from land treatment. Evaporation and seepage will deplete the present surface supply by approximately 3 percent.

The lower 12 miles of Long Branch Creek and the lower 4 miles of Kirkham Creek are classified as perennial streams in this report. There are no known long term gaging stations on either stream to confirm this or calculate what the quantity of base flow might be. There is some questions as to whether Kirkham Creek is properly classified. The Nebraska Game and Parks Commission lists this section of stream as "I" or intermittent.

Stream flow measurements taken in conjunction with water quality samples indicate that Kirkham Creek's base flow is less than 1 cubic feet per second and contributes approximately 20 percent to the total base flow downstream from its junction with Long Branch Creek.

It is not anticipated that the project measures will reduce the base stream flow on Long Branch Creek above the Kirkham Creek junction. All the project measures are located on intermittent streams. When these streams are flowing the reservoirs will be maintained at pool capacity and therefore pass the upstream flow. Some minor losses could be expected due to evaporation.

During periods of normal rainfall, runoff, and streamflow conditions it is not anticipated that the structure on Kirkham Creek will affect downstream base flows. Upstream flows will essentially pass directly through the principal spillway. However, during periods of droughty conditions, high reservoir evaporation losses, and reduced upstream base flow it can be expected that the reservoir losses would be more than the stream inflow, resulting in no passage of flow through the principal spillway. This could reduce the base flow on Kirkham and Long Branch Creeks by some indeterminable quantity. However, seepage losses around the through structures do occur, with a portion of this flow being excreted into the stream below the structure. This quantity of flow is very difficult to determine, but may tend to balance upstream losses.

Consultation with the Nebraska Game and Parks Commission indicates there are no fishery habitats on Kirkham Creek.

ECONOMIC AND SOCIAL

The average age of farmers in the watershed in 1969 was 50.3 years. Only 3.9 percent of the farms employed more than 150 hours of labor annually. These characteristics will not be changed by the project.

The average value of agricultural products sold per farm (147 farms in the watershed) in Long Branch Watershed was $20,700 in 1969. On the basis of the present aggregate value (1969) of production, the crop and pasture average annual benefit will result in an increase of $69,520 in production due to the project.

Project measures will also produce secondary or "impact" average annual benefits of $20,670. Part of the additional income to be realized following installation of project measures (reduced floodwater, erosion, and sediment damages) will be spent in the community thus generating additional income.

The area of the 13 floodwater retarding structure permanent pools is estimated to be 433 acres. In addition to the area in permanent pools, 109 acres are devoted to the structures and their emergency spillways making a total of 542 acres. The value of this acreage has been accounted for in the determination of the benefit-cost ratio.

Structural works of improvement will contribute to the alleviation of chronic unemployment and underemployment conditions which exist in Pawnee County. Semiskilled labor will be employed in the construction of structural measures. The operation and maintenance of structural works of improvement will further require the employment of semiskilled labor and will thus continue to reduce unemployment and underemployment. It is estimated that the average annual redevelopment benefits will be $10,070 over a 50-year period.

PROJECT BENEFITS

Works of improvement will reduce the estimated average annual damages within the watershed from $192,270 to $49,860 (Table 5). Structural measures are credited with $137,350 of this reduction while the remaining $5,060 will result from additional land treatment.

Crop and pasture floodwater damages will be reduced from $106,140 to $36,620 annually. Structural measures will reduce damages by $65,720 and land treatment will reduce damages by $3,800.

Floodwater damages to "Other Agricultural" properties will be reduced from annual losses of $10,600 to annual losses of $3,600. Structural measures will reduce damages by $6,670 and land treatment will reduce damages by $330.

Road and bridge floodwater damages will be reduced $8,220 annually. Most of the damage reduction can be credited to structural measures.

Downstream damages will be reduced $121,080 annually; $115,830 is accredited to structural measures and $5,250 is accredited to land treatment (Table 6, footnote 2).

Planned recreational facilities at site 21 will provide an estimated $56,700 in average annual recreational benefits (25,200 recreation visits at $2.25 per recreation visit).

Semiskilled labor requirements of structural measure construction and structural measure operations and maintenance will provide an estimated $10,090 in redevelopment benefits. In addition, planned structural measures will yield an estimated $20,670 in secondary or "impact" benefits.

Overbank deposition of sediment and scour damages will be reduced from annual losses of $4,950 to $750. Structural measures are credited with $3,900 and land treatment with $300 of the benefits.

Gully damages will be reduced by $43,750. This reduction will occur in those areas where grade stabilization structures will be constructed. All gully damage reduction will be credited to structural works of improvement. Average annual urban damages of $380 will be eliminated.

Indirect damages in the watershed will be reduced from $14,060 to $4,720. The indirect damage reduction benefits, including downstream indirect benefits of $10,740, will be credited to structural measures.

COMPARISON OF BENEFITS AND COSTS

Estimated average annual cost of the structural measures is $164,410 (Table 4). These structures when operational are expected to produce average annual benefits, excluding redevelopment and secondary, of $309,900. The ratio of benefits to costs is 1.9:1.0.

Total average annual structural benefits are expected to be $340,640. The ratio of these benefits to costs is 2.1:1.0 as shown on Table 6.

PROJECT INSTALLATION

Works of improvement are scheduled for installation over an 8 year period.

LAND TREATMENT MEASURES

The Nemaha Natural Resources District is responsible for leadership of land treatment application. It will give special emphasis on applying those land treatment measures listed in Table 1 to be applied during the project installation period.

Land treatment information listed in various tables of this plan and other conservation practices information was developed by local Soil Conservation Service technicians. Such information includes total conservation needs, conservation practices applied to date, costs of land treatment applied, and estimated costs of land treatment to be applied during the project installation period and following the project installation period.

In applying needed conservation measures Soil Conservation Service technicians will provide technical assistance for planning and installation.

Forestry land treatment measures will be installed and financed by the landowners and operators under cooperative programs authorized by the Clarke-McNary Act. Fire control measures will be installed by rural fire districts through the Cooperative Fire Control program. Technical assistance for installing both the forestry and fire control measures will be provided by the Nebraska State Extension Forester through cooperative agreement with the U. S. Forest Service. 1/

The educational phase of the project will be assisted by the Extension Service through the use of radio, newspaper, and other publicity media. Information on loans available for conservation work will be provided by the Farmers Home Administration and they will encourage borrowers to cooperate in project activities.

STRUCTURAL MEASURES

The Nemaha Natural Resources District, organized under Nebraska statutes, requested that the Soil Conservation Service administer construction contracts. The Service concurs in this request on the basis that each will bear the cost incurred for such contracts. These sponsors have been authorized this authority by the State of Nebraska.

The Natural Resources District will acquire necessary land rights in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 - Public Law 91-646 (84 Stat. 1894). All powers granted them by the state will be used if necessary to achieve project objectives

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which includes the right of eminent domain. One farmstead relocation will be necessary and relocation assistance and relocation payments will be furnished in accordance with the aforementioned law with the costs shared in accordance with provisions of the Watershed Work Plan Agreement. Inquiries in Humboldt and within the watershed area indicate that replacement housing is available.

The Nemaha Natural Resources District will have the land rights appraised by a qualified land appraiser prior to negotiations between the sponsoring local organization and the grantor of the land rights unless the land rights are donated. A donation of land or other real estate means to convey a land right in which the only consideration is a pro forma monetary amount or that the grantor of his own free will is willing to accept substantially less than fair market value for the land right.

Sponsors will obtain all land rights for structures to be included in their first two years construction schedule before construction funds will be obligated. They will work with the counties involved to develop satisfactory solutions to problems resulting from structural measures involving county or township roads.

P.L.-566 funds will be provided for structural measure installation costs including costs of design, geologic investigations, government representatives, construction surveys, and necessary inspections. Soil Conservation Service personnel will design structures, prepare specifications, administer contracts, supervise construction, prepare contract estimates, and perform other related duties for the establishment of planned structures.

The Nebraska Department of Health will provide technical assistance on prevention and control of mosquitos upon request of sponsors.

For basic recreation facilities at site 21, the architect and engineering contract will include engineering and architecture services, plus other technical services for surveys, investigations, designs and preparations of plans, and specifications. The architectural and engineering costs will be shared 50 - 50 between P.L.-566 and the local sponsor.

The sponsoring local organization has developed a plan of action for applying land treatment and obtaining land rights as follows:

Year	Acquire easements for and meet minimum requirements for establishment of land treatment
First Year	Two floodwater retarding structures and one grade stabilization structure
Second Year	Two floodwater retarding structures and two grade stabilization structures
Third Year	Two floodwater retarding structures and one grade stabilization structure

Fourth Year	One floodwater retarding structure and three grade stabilization structures
Fifth Year	One floodwater retarding structure and three grade stabilization structures
Sixth Year	Two floodwater retarding structures and one grade stabilization structure
Seventh Year	Two floodwater retarding structures and one grade stabilization structure
Eighth Year	One multiple-purpose structure

FINANCING PROJECT INSTALLATION

Cost of installing the project is estimated to be $2,902,020. Of this the Federal Government; under authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended; will provide $2,047,970. Local interests, using other authorities and private funds, will provide $854,050. The Soil Conservation Service will consider that the Nemaha Natural Resources District is eligible for financial assistance under P.L.-566 as soon as all the requirements for land treatment and land rights are obtained for the first two years' construction schedule. Availability of financial and other assistance to be furnished by the Soil Conservation Service under Public Law 566 and other authorities depends upon appropriations made for these purposes.

The estimated costs for installation of land treatment measures are Cropland, $224,000; Pastureland, $59,000; Forestland, $12,300; Other land, $16,500; and Fire control, $40,000. Individual landowners and funds from other federal programs will bear these costs of installation. Technical forestry assistance costs will be furnished by the Nebraska State and Extension Forester, $2,750 and contributions from ongoing forestry programs, $250 (Table 1). 1/

The Soil Conservation Service will furnish $68,300 of the technical assistance cost over the 8-year installation period using P.L.-46 funds. This is for the going program established in the Nemaha NRD. It is equivalent to 1,425 man-hours per year. P.L.-566 funds will furnish $22,000 for technical assistance, including $10,000 for the completion of standard soil surveys in Johnson and Nemaha Counties and $12,000 for technical forestry assistance.

The Nemaha Natural Resources District, organized under sections 2-3201 and 2-3261 of the Nebraska Statutes, will be responsible for $430,950 of estimated costs under other funds for structural measures. To meet its obligations the Nemaha NRD can levy up to 1 mill ad valorem taxes on tangible property. Included in these costs are $113,750 for construction costs, $9,170 for engineering costs, $296,000 for land rights costs, $2,760 for relocation costs, and $9,270 for project administration.

The sponsoring local organization can acquire low interest loans through the Farmers Home Administration for use in fulfilling their obligations.

The Nemaha Natural Resources District may obtain money if needed from the "small watershed control fund" administered by the State of Nebraska through the State Natural Resources Commission to assist in acquisition of necessary land rights. Funds from this source could be used to finance a significant portion of the cost of land rights (sections 2-1502 and 2-1503, R.S. 1943, as amended, 1963, of Nebraska Statutes).

The sponsoring local organization and the Soil Conservation Service will develop annual plans of work. These plans will show the work to be

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accomplished in an orderly manner. Requests for allocation of government funds will be based upon these plans. Signing of the project agreement will authorize construction. Government funds will be obligated when construction contracts are awarded. The project agreement will also spell out cost-share arrangements.

Prior to entering into agreements that obligate funds of the Service, the Nemaha Natural Resources District will have a financial management system for control, accountability, and disclosure of P.L.-566 funds received, and for control and accountability for property and other assets purchased with P.L.-566 funds.

Program income earned during the grant period will be reported on the sponsor's request for advance or reimbursement from the Soil Conservation Service.

PROVISIONS FOR

OPERATION AND MAINTENANCE

LAND TREATMENT MEASURES

Landowners and operators will operate and maintain land treatment measures. Directors of the Nemaha Natural Resources District will encourage owners and operators to perform needed conservation maintenance. Technical assistance will be furnished by the Soil Conservation Service in applying maintenance to land treatment measures.

The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with P.L.-566 financial assistance.

Technical assistance to landowners and operators for operating and maintaining the forestry measures beyond the installation period will be provided by the Nebraska State and Extension Forester in cooperation with the U. S. Forest Service through continuing cooperative programs. 1/

STRUCTURAL MEASURES

The Nemaha Natural Resources District will operate and maintain the structural measures and recreation facilities. Representatives of the Soil Conservation Service and the Nemaha NRD will make a joint inspection annually or after unusually severe floods for three years following installation of each structure and recreation facilities. The Soil Conservation Service will not participate in annual inspections of grade stabilization structures and floodwater retarding structures after this three year period. The Service will continue to participate in the annual inspections of multiple-purpose structure 21 and the recreation facilities until such time as the State Conservationist determines that further service participation on this basis is no longer necessary. Inspection then will be made annually by the Nemaha NRD and a report prepared by them with a copy to the Service representative. Reports prepared will state maintenance and repairs needed and an agreed date when repairs will be completed.

Nine grade stabilization structures included in this plan are designed with corrugated metal conduits with cathodic protection to serve as principal spillways. The anticipated average life of these conduits is 50 years. Any associated cost of repair or replacement shall be considered as maintenance.

Maintenance of all structures may include major repairs such as repair or replacement of principal spillways, replacing trash racks, and repairing or replacing concrete materials. Other items include clearing the trash rack, cleaning debris from face of dam and shoreline, repairing eroded areas,

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controlling rodents, mowing, repairing fences, and the periodic control of mosquitoes by mechanical, chemical, or biological measures if conditions develop in depressions or borrow areas, affected by the maximum pool levels of the reservoir, that are conducive to mosquito production. Operation and maintenance of the multiple-purpose structure will also include all cost for services required to operate the recreational facilities which might include such items as collection of use revenues, caretaker, concessions, replacement of facilities, waste disposal, etc.. The installation and operation and maintenance of the planned features will meet the requirements of the state and local health agencies. An establishment period, to allow time for latent defects to become apparent, shall extend three years from the date the structural works of improvement are accepted from the contractor as being completed. The establishment period for vegetative work associated with a structural measure is to terminate when any of the following conditions are met:

a. Adequate vegetative cover is obtained.

b. Two growing seasons have elapsed after the initial installation of vegetative work.

c. The establishment period for the associated structural measure has terminated.

Operation and maintenance responsibility rests with the sponsor during the establishment period, as it does during the remainder of the project life, except that the Service will consider sharing in the cost of repairs (on a case-by-case basis) which become necessary as a result of latent defects. Cost sharing will be at the rate used in project installation. This cost will be borne by the Nemaha Natural Resources District.

Funds, materials, and labor for carrying out operation and maintenance work will be furnished by the Nemaha NRD. Average annual operation and maintenance costs are estimated to be $11,240 for all structures and recreational facilities (Table 4). Operation, maintenance, and replacement of recreational facilities is estimated at $6,300 annually.

Should it become necessary to collect a use fee, such fees will not exceed the amount needed to defray operation and maintenance expense and pay off the sponsor's original investment.

An agreement between the Soil Conservation Service and the Nemaha NRD specifying detailed operational requirements for all structural measures will be developed and signed concurrently with the signing of the first project agreement. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with P.L.-566 assistance.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Long Branch Watershed, Nebraska

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) 1/ P.L.-566 Funds SCS 2/	P.L.-566 Funds FS 2/	P.L.-566 Funds Total	Other Funds SCS 2/	Other Funds FS 2/	Other Funds Total	Total
LAND TREATMENT									
Land Areas 3/									
Cropland	Acres	7,800	-	-	-	224,000	-	224,000	224,000
Pastureland	to be	3,070	-	-	-	59,000	-	59,000	59,000
Forestland	Treated	1,590	-	-	-	-	12,300	12,300	12,300
Other Land		100	-	-	-	16,500	-	16,500	16,500
Individual Practices Fire Control	Acres to be Treated	46,905	-	-	-	-	40,000 4/	40,000	40,000
Technical Assistance			10,000 5/	12,000	22,000	68,300	3,000 6/	71,300	93,300
TOTAL LAND TREATMENT			10,000	12,000	22,000	367,800	55,300	423,100	445,100
STRUCTURAL MEASURES									
Construction									
Grade Stabilization Strs.	Each	12	397,750	-	397,750	-	-	-	397,750
Floodwater Retarding Strs.	Each	12	840,150	-	840,150	-	-	-	840,150
Multiple-Purpose Str.	Each	1	218,720	-	218,720	52,640	-	52,640	271,360
Recreation Facilities			61,110	-	61,110	61,110	-	61,110	122,220
Subtotal - Construction			1,517,730	-	1,517,730	113,750	-	113,750	1,631,480

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST (Continued) — Long Branch Watershed, Nebraska

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) 1/ P.L.-566 Funds SCS 2/	P.L.-566 Funds FS 2/	P.L.-566 Funds Total	Other Funds SCS 2/	Other Funds FS 2/	Other Funds Total	Total
Engineering Services		-	138,990	-	138,990	9,170	-	9,170	148,160
Relocation Payments		-	6,600	-	6,600	2,760	-	2,760	9,360
Project Administration									
Construction Inspection		-	145,180	-	145,180	-	-	-	145,180
Other		-	118,770	-	118,770	8,670	-	8,670	127,440
Relocation Assistance Advisory Services		-	200	-	200	600	-	600	800
Subtotal - Administration		-	264,150	-	264,150	9,270	-	9,270	273,420
Other Costs									
Land Rights		-	98,500	-	98,500	296,000	-	296,000	394,500
Subtotal - Other		-	98,500	-	98,500	296,000	-	296,000	394,500
TOTAL STRUCTURAL MEASURES		-	2,025,970	-	2,025,970	430,950	-	430,950	2,456,920
TOTAL PROJECT		-	2,035,970	12,000	2,047,970	798,750	55,300	854,050	2,902,020

1/ Price base 1975.
2/ Federal agency responsible for assisting in installation of works of improvement.
3/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed and dollar amounts apply to total land areas, not just to adequately treated areas.
4/ Fire control equipment provided by the Nebraska State Forester under the Cooperative Fire Program.
5/ For completion of standard soil surveys in Johnson and Nemaha Counties.
6/ Includes $250 "Going Forestry Program".

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TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
AT TIME OF WORK PLAN PREPARATION

Long Branch Watershed, Nebraska

Measures	Unit	Applied to Date	Total Cost (Dollars) 1/
LAND TREATMENT			
Soil Conservation Service			
Conservation Cropping System	acre	24,957	74,900
Contour Farming	acre	18,276	18,300
Terraces	mile	1,194	364,200
Diversions	mile	17	8,600
Grass Waterways	acre	1,190	255,800
Erosion Control Structures	No.	148	240,500
Drainage	mile	10	7,400
Proper Grazing	acre	863	1,100
Deferred Grazing	acre	440	500
Pasture Seeding	acre	10,134	261,300
Pasture Management	acre	6,983	7,000
Farm Ponds	No.	99	148,500
Critical Area Plantings	acre	182	27,300
Farmstead Windbreaks	acre	27	3,400
Forest Service			
Intensified Fire Control	acre	46,905	45,000
Forest - Proper Harvest	acre	20	200
Forestation	acre	20	1,000
Farm Plans			
Basic Conservation Plans	No.	199	--
Cooperators	No.	206	--
TOTAL			1,465,000

1/ Price base 1975.

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Long Branch Watershed, Nebraska
(Dollars) 1/

Item	Installation Cost - P.L.-566 Funds					Installation Cost - Other Funds					Total Installation Other
	Construction 2/	Engineering	Land Rights	Reloc. Payments	Total P. L. 566	Construction	Engineering	Land Rights	Reloc. Payments	Total Other	
Grade Stabilization Structures											
1-1	26,150	2,300	-	-	28,450	-	-	1,500	-	1,500	29,950
N-1	32,200	2,850	-	-	35,050	-	-	2,900	-	2,900	37,950
N-5	31,650	2,800	-	-	34,450	-	-	4,000	-	4,000	38,450
N-6	41,350	3,500	-	-	44,850	-	-	4,000	-	4,000	48,850
N-7	28,350	2,500	-	-	30,850	-	-	2,500	-	2,500	33,350
P-4-A	30,550	2,700	-	-	33,250	-	-	4,500	-	4,500	37,750
P-4-B	33,850	3,000	-	-	36,850	-	-	4,000	-	4,000	40,850
P-3	49,250	4,400	-	-	53,650	-	-	6,000	-	6,000	59,650
P-8	36,050	3,200	-	-	39,250	-	-	3,500	-	3,500	42,750
R-3	30,550	2,700	-	-	33,250	-	-	4,000	-	4,000	37,250
R-11	27,250	2,400	-	-	29,650	-	-	3,000	-	3,000	32,650
R-15	30,550	2,700	-	-	33,250	-	-	2,500	-	2,500	35,750
Subtotal Grade Stab. Structures	397,750	35,050	-	-	432,800	-	-	42,400	-	42,400	475,200
Floodwater Retarding Structures											
2	79,500	7,150	-	-	86,650	-	-	22,000 3/	-	22,000	108,650
3	54,750	4,900	-	-	59,650	-	-	7,900	-	7,900	67,550
4	54,200	4,850	-	-	59,050	-	-	9,600	-	9,600	68,650
7	90,500	8,150	-	-	98,650	-	-	22,000 4/	-	22,000	120,650
41	106,450	9,600	-	-	116,050	-	-	20,000	-	20,000	136,050
42	54,750	4,900	-	-	59,650	-	-	6,100	-	6,100	65,750
61	72,350	6,500	-	-	78,850	-	-	12,200	-	12,200	91,050
70	73,450	6,600	-	-	80,050	-	-	11,000	-	11,000	91,050
71	75,650	6,800	-	-	82,450	-	-	18,500	-	18,500	100,950
73	72,350	6,500	-	-	78,850	-	-	10,700	-	10,700	89,550
77	51,450	4,600	-	-	56,050	-	-	6,400	-	6,400	62,450
91	54,750	4,900	-	-	59,650	-	-	7,600	-	7,600	67,250

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION (Continued) — Long Branch Watershed, Nebraska

Item	Installation Cost - P.L.-566 Funds: Construction 2/	Engineering	Land Rights	Reloc. Payments	Total P. L. 566	Installation Cost - Other Funds: Construction	Engineering	Land Rights	Reloc. Payments	Total Other	Total Installation Other
Subtotal Floodwater Retarding Structures	840,150	75,450	-	-	915,600	-	-	154,000	-	154,000	1,069,600
Multiple-Purpose Structure 21	218,720	19,320	78,100 5/	6,600	322,740	52,640	-	79,000 6/	2,760	134,400	457,140
Recreation Facilities	61,110	9,170	20,400	-	90,680	61,110	9,170	20,600 7/	-	90,880	181,560
Subtotal Multiple-Purpose Structures	279,830	28,490	98,500	6,600	413,420	113,750	9,170	99,600	2,760	225,280	638,700
Subtotal Structural Measures	1,517,730	138,990	98,500	6,600	1,761,820	113,750	9,170	296,000	2,760	421,680	2,183,500
Project Administration					264,150					9,270	273,420
GRAND TOTAL	1,517,730	138,990	98,500	6,600	2,025,970	113,750	9,170	296,000	2,760	430,950	2,456,920

1/ Price base 1975.
2/ Construction costs of each structure includes cost of mitigation.
3/ Includes $3,000 for concrete encasement of 2 natural gas pipelines located in flood pool area.
4/ Includes $5,000 for road and bridge modification.
5/ Includes $1,000 for road modification,$500 for powerline modification,and $5,000 for rural waterline relocation.
6/ Includes $1,000 for road modification, $500 for powerline modification, $600 for 4.5 acres of flowage easements, $300 for legal fees, and $5,000 for rural waterline relocation.
7/ Includes $200 for legal fees.

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TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Long Branch Watershed, Nebraska
(Dollars) 1/

Item	COST ALLOCATION PURPOSE			COST SHARING P. L. 566			COST SHARING OTHER		
	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total	Flood Prevention	Recreation	Total
12 Grade Stabilization Structures	475,200	-	475,200	432,800	-	432,800	42,400	-	42,400
12 Floodwater Retarding Structures	1,069,600	-	1,069,600	915,600	-	915,600	154,000	-	154,000
1 Multi-purpose Structure (21)	185,320	271,820	457,140	184,720	138,020	322,740	600	133,800	134,400
Recreation Facilities	-	181,560	181,560	-	90,680	90,680	-	90,880	90,880
GRAND TOTAL	1,730,120	453,380	2,183,500	1,533,120	228,700	1,761,820	197,000	224,680	421,680

1/ Price Base - 1975.

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TABLE 2B - STRUCTURE 21 RECREATION FACILITIES
Estimated Construction Costs

Long Branch Watershed, Nebraska
(Dollars) 1/

Item	Number 3/	Estimated Unit Cost	Total Construction Cost
AREA I - PICNIC AREA			
Parking spaces, 10' x 20', gravel or crushed rock with barriers	40	$ 66.00	$ 2,640
Water Development, hydrant, 2" plastic pipeline and hookup of $400	2640 ft.	2.50	6,600
Comfort station: 2 units, male; 2 units, female 2/	1	4,400.00	4,400
Picnic tables, wood, steel legs	20	83.00	1,660
Picnic grills, steel, waist-high	10	50.00	500
Trash disposal station, concrete with steel post	8	30.00	240
Fishing Dock	1	2,200.00	2,200
Picnic shelter	1	2,750.00	2,750
		Subtotal	$ 20,990
AREA II - DAY USE AREA			
Parking spaces, 10' x 20', gravel or crushed rock with barriers	20	66.00	1,320
Comfort station: 2 units, male; 2 units, female 2/	1	4,400.00	4,400
Water development pipeline or spring development	1	2,200.00	2,200
Picnic tables, wood, steel legs	10	83.00	830
Picnic grills, steel, waist-high	5	50.00	250

TABLE 2B - STRUCTURE 21 RECREATION FACILITIES (Cont.)
Long Branch Watershed, Nebraska

Item	Number 3/	Estimated Unit Cost	Total Construction Cost
Trash disposal station, concrete with steel posts	4	$ 30.00	$ 120
		Subtotal	9,120
AREA III - BOAT LAUNCH			
Parking spaces, 10' x 40', car & trailer, gravel or crushed rock, with barriers	35	110.00	3,850
Boat ramp, concrete, 14' x 75'	1	1,650.00	1,650
Boat dock, floating	1	1,100.00	1,100
Comfort station: 2 units, male; 1 unit, female 2/	1	3,300.00	3,300
Water development, hydrant, 2" plastic pipeline	2500 ft.	2.30	5,750
Trash disposal station, concrete with steel posts	1	30.00	30
		Subtotal	$ 15,680
AREA IV - FISHING ACCESS			
Parking spaces, 10' x 20', gravel or crushed rock, with barriers	20	66.00	1,320
Comfort station: 2 units, male; 1 unit, female 2/	1	3,300.00	3,300
Water development, hydrant, 2" plastic pipeline	1500 ft.	2.30	3,450
		Subtotal	$ 8,070

TABLE 2B - STRUCTURE 21 RECREATION FACILITIES (Cont.)
Long Branch Watershed, Nebraska

Item	Number 3/	Estimated Unit Cost	Total Construction Cost
AREA V - FISHING ACCESS			
Parking spaces, 10' x 20', gravel or crushed rock, with barriers	10	$ 66.00	$ 660
Trash disposal station, concrete with steel posts	1	30.00	30
Comfort station: 1 unit, male; 1 unit, female 2/	1	2,200.00	2,200
		Subtotal	$ 2,890
AREA VI - PRIMITIVE CAMPING AREA			
Nature trail	5000 ft.	1.00	5,000
Comfort station: 1 unit, male; 1 unit female 2/	1	2,200.00	2,200
		Subtotal	$ 7,200
GENERAL			
Access roads, 2-lane, 22' wide, 2" gravel	6360 ft.	4.95	31,480
Grade stabilization structures for road fill	2	8,800.00	17,600
Grass seeding	20 ac.	30.00	600
Fencing	5.5 mi.	1,000.00	5,500
Signs (directional)	Lump	290.00	290
Electrical system for Area I	Lump	1,100.00	1,100
Gates	1	50.00	50
Trees and planting	300	5.50	1,650
		Subtotal	58,270
		GRAND TOTAL	$122,220

1/ Price Base - 1975.
2/ Vault type or better.
3/ Estimated quantity, subject to minor variation at time of detailed planning.

TABLE 3 - STRUCTURE DATA

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 2	3	4	7
Class of Structure		a	a	a	b
Drainage Area	sq.mi.	2.17	1.22	1.33	2.86
Controlled	sq.mi.	-	-	-	-
Curve No. (1-day) (AMC II)		79	79	79	79
Tc	hrs.	2.10	1.20	1.80	3.00
Elevation Top of Dam	ft. MSL	1207.0	1199.5	1183.0	1144.0
Elevation Crest Emergency Spillway	ft. MSL	1203.0	1195.5	1179.0	1138.4
Elevation Crest High Stage Inlet	ft. MSL	1194.5	1186.5	1170.5	1124.5
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-	-
Maximum Height of Dam	ft.	36	32	33	38
Volume of Fill	1000 cu.yd.	70	44	44	92
Total Capacity	ac.ft.	490	260	305	597
Sediment Submerged	ac.ft.	128	68	88	74
Sediment Aerated	ac.ft.	25	13	17	17
Beneficial Use (Recreation)	ac.ft.	-	-	-	-
Retarding	ac.ft.	337	179	200	506
Between high and low stage	ac.ft.	-	-	-	-
Surface area					
Sediment pool	acres	25	12	15	15 1/
Beneficial use pool (Recreation)	acres	-	-	-	-
Retarding pool	acres	63	31	36	64
Principal Spillway					
Rainfall Volume (areal) (1 day)	in.	5.60	5.60	5.70	6.30
Rainfall Volume (areal) (10 day)	in.	9.10	9.10	9.30	10.10
Runoff Volume (10 day)	in.	4.62	4.62	4.78	5.46
Capacity of Low Stage (Max.)	cfs	-	-	-	-
Capacity of High Stage (Max.)	cfs	33	30	32	62
Frequency operation - Emer. Spillway	% chance	4	4	4	4
Size of Conduit	dia.	18	18	18	24
Emergency Spillway					
Rainfall Volume (ESH) (areal)	in.	5.40	5.40	5.40	7.85
Runoff Volume (ESH)	in.	3.14	3.14	3.14	5.36
Type		----------	----------	Vegetated	----------
Bottom Width	ft.	50	50	50	200
Velocity of Flow (Ve)	ft./sec.	3.2	3.6	3.3	5.5
Slope of exit channel	ft./ft.	.045	.042	.041	.034
Maximum water surface elevation	ft. MSL	1203.1	1195.9	1179.2	1140.0
Freeboard					
Rainfall Volume (FH) (areal)	in.	7.80	7.80	7.90	13.5
Runoff Volume (FH)	in.	5.32	5.32	5.41	10.76
Maximum water surface elevation	ft. MSL	1205.3	1197.7	1181.4	1142.0
Capacity Equivalents					
Sediment Volume	in.	1.32	1.24	1.48	0.60
Retarding Volume	in.	2.91	2.76	2.82	3.32

1/ Structure 7 will have an open port at elevation 1120; therefore, only an 8 acre pool will be created initially.

TABLE 3 - STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 21	41	42	61 1/
Class of Structure		c	a	a	c
Drainage Area	sq.mi.	7.65	3.97	0.94	1.25
Controlled	sq.mi.	1.62 2/	-	-	-
Curve No. (1-day) (AMC II)		79	79	79	79
Tc	hrs.	7.00	3.00	1.40	1.30
Elevation Top of Dam	ft. MSL	1064.0	1064.0	1068.5	1170.0
Elevation Crest Emergency Spillway	ft. MSL	1058.0	1058.5	1064.5	1165.0
Elevation Crest High Stage	ft. MSL	1048.0	1044.5	1055.0	1163.0
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-	1153.5
Maximum Height of Dam	ft.	56	42	31	35
Volume of Fill	1000 cu.yd.	295	115	49	61
Total Capacity	ac.ft.	3800	793	180	345
Sediment Submerged	ac.ft.	211	142	45	62
Sediment Aerated	ac.ft.	41	28	10	13
Beneficial Use (Recreation)	ac.ft.	1475	-	-	-
Retarding	ac.ft.	2073	623	125	270
Between high and low stage	ac.ft.	-	-	-	208
Surface Area					
Sediment pool	acres	-	26	9	12
Beneficial use pool (Recreation)	acres	159	-	-	-
Retarding pool	acres	265	70	20	38
Principal Spillway					
Rainfall Volume (areal) (1 day)	in.	7.0	5.70	5.70	7.05
Rainfall Volume (areal) (10 day)	in.	11.2	9.30	9.30	11.30
Runoff Volume (10 day)	in.	6.4	4.78	4.78	6.49
Capacity of Low Stage (Max.)	cfs	-	-	-	21
Capacity of High Stage (Max.)	cfs	125	66	32	103
Frequency operation - Emer. Spillway	% chance	1	4	4	1
Size of Conduit	dia.	30	24	18	30
Emergency Spillway					
Rainfall Volume (ESH) (areal)	in.	11.30	5.45	5.40	10.85
Runoff Volume (ESH)	in.	8.63	3.19	3.14	8.20
Type		----------Vegetated----------			
Bottom Width	ft.	400	50	50	200
Velocity of Flow (Ve)	ft./sec.	6.0	2.9	3.9	6.0
Slope of exit channel	ft./ft.	.035	.049	.042	.038
Maximum water surface elevation	ft. MSL	1059.9	1058.6	1065.1	1166.8
Freeboard					
Rainfall Volume (FH) (areal)	in.	27.0	7.95	7.90	25.90
Runoff Volume (FH)	in.	24.05	5.46	5.41	22.96
Maximum water surface elevation	ft. MSL	1063.6	1062.0	1066.7	1170.0
Capacity Equivalents					
Sediment Volume	in.	0.62	0.80	1.10	1.12
Retarding Volume	in.	5.08	2.94	2.50	4.05

1/ Structure 61 will have a two-stage inlet.
2/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

TABLE 3 - STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 70	71	73
Class of Structure		a 1/	b	a
Drainage Area	sq.mi.	1.47	2.44	1.65
Controlled	sq.mi.	0.94 2/	-	-
Curve No. (1-day) (AMC II)		79	79	79
Tc	hrs.	1.50	1.95	1.90
Elevation Top of Dam	ft. MSL	1116.5	1221.0	1088.0
Elevation Crest Emergency Spillway	ft. MSL	1111.0	1215.5	1083.2
Elevation Crest High Stage Inlet	ft. MSL	1099.5	1205.5	1073.5
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-
Maximum Height of Dam	ft.	35	31	36
Volume of Fill	1000 cu.yd.	71	60	69
Total Capacity	ac.ft.	360	580	375
Sediment Submerged	ac.ft.	80	103	104
Sediment Aerated	ac.ft.	16	20	20
Beneficial Use (Recreation)	ac.ft.	-	-	-
Retarding	ac.ft.	264	457	251
Between high and low stage	ac.ft.	-	-	-
Surface Area				
Sediment pool	acres	15	23	17
Beneficial use pool (Recreation)	acres	-	-	-
Retarding pool	acres	34	78	39
Principal Spillway				
Rainfall Volume (areal) (1 day)	in.	6.35	6.30	5.70
Rainfall Volume (areal) (10 day)	in.	10.10	10.10	9.30
Runoff Volume (10 day)	in.	5.46	5.46	4.78
Capacity of Low Stage (Max.)	cfs	-	-	-
Capacity of High Stage (Max.)	cfs	65	60	32
Frequency operation - Emer. Spillway	% chance	2 1/	2	4
Size of Conduit	dia.	24	24	18
Emergency Spillway				
Rainfall Volume (ESH) (areal)	in.	7.90	7.90	5.40
Runoff Volume (ESH)	in.	5.41	5.41	3.14
Type		---------Vegetated---------		
Bottom Width	ft.	100	100	50
Velocity of Flow (Ve)	ft./sec.	5.9	5.6	2.8
Slope of exit channel	ft./ft.	.033	.037	.050
Maximum water surface elevation	ft. MSL	1112.6	1217.2	1083.4
Freeboard				
Rainfall Volume (FH) (areal)	in.	13.60	13.60	7.90
Runoff Volume (FH)	in.	10.85	10.85	5.41
Maximum water surface elevation	ft. MSL	1115.0	1219.7	1085.8
Capacity Equivalents				
Sediment Volume	in.	1.22	0.94	1.41
Retarding Volume	in.	3.37	3.52	2.86

1/ Used Class B hydrologic criteria.
2/ Grade stabilization structure N-6 was routed in series with structure 70.

TABLE 3 - STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number 77	91	P-3
Class of Structure		a	b	a 1/
Drainage Area	sq.mi.	0.76	0.99	1.14
Controlled	sq.mi.	-	-	0.48 2/
Curve No. (1-day) (AMC II)		79	79	78
Tc	hrs.	0.90	1.60	1.30
Elevation Top of Dam	ft. MSL	1128.5	1149.0	1150.0
Elevation Crest Emergency Spillway	ft. MSL	1124.5	1144.0	1145.0
Elevation Crest High Stage Inlet	ft. MSL	1117.5	1135.0	1134.0
Elevation Crest Low Stage Inlet	ft. MSL	-	-	-
Maximum Height of Dam	ft.	34	34	31
Volume of Fill	1000 cu.yd.	36	41	43
Total Capacity	ac.ft.	159	235	300
Sediment Submerged	ac.ft.	53	73	48
Sediment Aerated	ac.ft.	10	14	9
Beneficial Use (Recreation)	ac.ft.	-	-	-
Retarding	ac.ft.	96	148	243
Between high and low stage	ac.ft.	-	-	-
Surface Area				
Sediment pool	acres	10	12	11
Beneficial use pool (Recreation)	acres	-	-	-
Retarding pool	acres	20	24	38
Principal Spillway				
Rainfall Volume (areal) (1 day)	in.	5.7	6.3	6.3
Rainfall Volume (areal) (10 day)	in.	9.3	10.1	10.2
Runoff Volume (10 day)	in.	4.78	5.46	5.35
Capacity of Low Stage (Max.)	cfs	-	-	-
Capacity of High Stage (Max.)	cfs	37	70	31
Frequency operation - Emer. Spillway	% chance	4	2	2 1/
Size of Conduit	dia.	18	24	18
Emergency Spillway				
Rainfall Volume (ESH) (areal)	in.	5.4	7.90	7.9
Runoff Volume (ESH)	in.	3.14	5.41	5.29
Type		---------Vegetated---------		
Bottom Width	ft.	50	100	50
Velocity of Flow (Ve)	ft./sec.	3.0	5.1	4.4
Slope of exit channel	ft./ft.	.056	.037	.040
Maximum water surface elevation	ft. MSL	1125.1	1145.5	1146.2
Freeboard				
Rainfall Volume (FH) (areal)	in.	7.9	13.60	13.60
Runoff Volume (FH)	in.	5.41	10.85	10.71
Maximum water surface elevation	ft. MSL	1126.4	1147.4	1148.2
Capacity Equivalents				
Sediment Volume	in.	1.56	1.65	0.94
Retarding Volume	in.	2.37	2.80	4.00

1/ Used Class B hydrologic criteria.
2/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

TABLE 3 - STRUCTURE DATA (Continued)

Long Branch Watershed, Nebraska

Item	Unit	Structure Number P-8	Structure Number N-6	Totals
Class of Structure		a	a	
Drainage Area	sq.mi.	0.48 1/	0.94 2/	31.26
Controlled	sq.mi.	-	-	
Curve No. (1-day) (AMC II)		78	79	
Tc	hrs.	0.90	0.90	
Elevation Top of Dam	ft. MSL	1193.0	1160.0	
Elevation Crest Emergency Spillway	ft. MSL	1189.0	1156.1	
Elevation Crest High Stage Inlet	ft. MSL	1183.5	1149.0	
Elevation Crest Low Stage Inlet	ft. MSL	-	-	
Maximum Height of Dam	ft.	25	29	
Volume of Fill	1000 cu.yd.	28	34	1,152
Total Capacity	ac.ft.	93	197	9,069
Sediment Submerged	ac.ft.	28	59	1,366
Sediment Aerated	ac.ft.	5	12	270
Beneficial Use (Recreation)	ac.ft.	-	-	1,475
Retarding	ac.ft.	60	126	5,958
Between high and low stage	ac.ft.	-	-	208
Surface area				
Sediment pool	acres	7	12	221
Beneficial use pool (Recreation)	acres	-	-	159
Retarding pool	acres	16	28	864
Principal Spillway				
Rainfall Volume (areal) (1 day)	in.	5.7	5.65	
Rainfall Volume (areal) (10 day)	in.	9.2	9.20	
Runoff Volume (10 day)	in.	4.53	4.70	
Capacity of Low Stage (Max.)	cfs	-	-	
Capacity of High Stage (Max.)	cfs	28	32	
Frequency operation - Emer. Spillway	% chance	4	4	
Size of Conduit	dia.	18	18	
Emergency Spillway				
Rainfall Volume (ESH) (areal)	in.	5.4	5.40	
Runoff Volume (ESH)	in.	3.05	3.14	
Type		------Vegetated-----		
Bottom Width	ft.	50	50	
Velocity of Flow (Ve)	ft./sec.	3.4	3.4	
Slope of exit channel	ft./ft.	.048	.043	
Maximum water surface elevation	ft. MSL	1189.4	1156.6	
Freeboard				
Rainfall Volume (FH) (areal)	in.	7.90	7.90	
Runoff Volume (FH)	in.	5.29	5.41	
Maximum water surface elevation	ft. MSL	1190.5	1158.1	
Capacity Equivalents				
Sediment Volume	in.	1.29	1.42	
Retarding Volume	in.	2.34	2.51	

1/ Grade stabilization structures P-3 and P-8 were routed in series with each other and with structure 21.

2/ Grade stabilization structure N-6 was routed in series with structure 70.

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TABLE 3A - STRUCTURAL DATA

GRADE STABILIZATION STRUCTURES

Long Branch Watershed, Nebraska

Site No. or Station	Drainage Area (Sq.Mi.)	Design Capacity Principal Spillway (cfs)	Assoc. Frequency and Duration of Storm (% chance and hours)	Drop (Feet)	Volume of Fill (Cu.Yds.)	Type of Structure	Surface Areas (Acres) At Riser Crest	Surface Areas (Acres) At Emergency Spillway Elevation
1-1	.33	120	4 - 6	13	16,000	Drop Inlet	1.8	5.5
N-1	.55	83	4 - 6	17	24,000	Drop Inlet	5.4	10.0
N-5	.52	91	4 - 6	24	23,000	Drop Inlet	7.9	12.0
N-7	.29	32	4 - 6	15	24,000	Drop Inlet	4.0	7.0
R-3	.57	126	4 - 6	18	24,000	Drop Inlet	9.0	16.0
R-11	.40	83	4 - 6	20	19,000	Drop Inlet	5.6	9.4
R-15	.67	122	4 - 6	17	26,000	Drop Inlet	5.0	11.5
P-4-A	.71	124	4 - 6	17	22,000	Drop Inlet	8.2	17.0
P-4-B	.55	77	4 - 6	15	22,000	Drop Inlet	6.2	13.0

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TABLE 4 - ANNUAL COST

Long Branch Watershed, Nebraska
(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost 3/	Total
12 Grade Stabilization Structures, 12 Floodwater Retarding Structures, and 1 Multi-purpose Structure	136,120	11,240	147,360
Project Administration	17,050		17,050
GRAND TOTAL	153,170	11,240	164,410

1/ Price Base - Installation O&M 1975.
2/ Fifty years at 5-7/8 percent interest.
3/ Includes $6,300 for operation, maintenance, and replacement for recreational development.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Long Branch Watershed, Nebraska
(Dollars) 1/

Item	Estimated Average Annual Damage: Without Project	Estimated Average Annual Damage: With Project	Damage Reduction Benefit
Floodwater			
Crop and Pasture	106,140	36,620	69,520
Other Agriculture	10,600	3,600	7,000
Road and Bridge	12,390	4,170	8,220
Urban	380	0	380
Subtotal	129,510	44,390	85,120
Sediment and Erosion			
Overbank Deposition and Flood Plain Scour	4,950	750	4,200
Gullies 2/	43,750	0	43,750
Subtotal	48,700	750	47,950
Indirect	14,060	4,720	9,340
Total (within Long Branch)	192,270	49,860	142,410
Downstream (Lower Big and South Fork Big Nemaha)			90,780
Other Agriculture			4,340
Road and Bridge			4,340
Indirect			10,740
Sediment			10,880
Total Downstream Benefits			121,080
GRAND TOTAL BENEFITS			263,490

1/ Price Base - Current Normalized (Water Resources Council - October 1974) for crop and pasture. All other items are 1975.

2/ This includes only the damages and benefits occurring from voiding or land deterioration that are affected by structural measures.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Long Branch Watershed, Nebraska
(Dollars)

Evaluation Unit	Average Annual Benefits 1/					Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction	Recreation	Redevelop-ment	Secondary	Total		
12 Grade Stabilization Structures, 12 Floodwater Retarding Structures, and 1 Multi-purpose Structure	253,180	56,700	10,090	20,670	340,640	147,360	2.3:1.0
Project Administration						17,050	
GRAND TOTAL	253,180 2/	56,700	10,090	20,670	340,640	164,410	2.1:1.0

1/ Price base current normalized.
2/ In addition, land treatment measures will provide damage reduction benefits of $10,310, including $5,250 downstream.
3/ Amortized at 5-7/8 percent interest for 50 years.

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INVESTIGATIONS AND ANALYSES

LAND TREATMENT INVESTIGATIONS

Soil Conservation Service Field Office technicians and the State Extension Forester determined present and future land uses and conservation treatment measures. This information was used to prepare Tables 1 and 1A. This consisted of such items as land treatment measures to be used, unit cost, technical assistance time, those amounts of measures required for total needs, amounts applied to date and during project installation, and an analysis of basic and revised Conservation plans.

HYDRAULIC AND HYDROLOGIC INVESTIGATIONS

Hydraulic and hydrologic investigations were made primarily to determine runoff characteristics which are expected to take place before and after the conditions of this plan have been fulfilled.

Twenty-four valley and channel cross sections were field surveyed. Area inundated by depth increments versus discharge is based on these cross sections. Computations were developed using the Water Surface Profiles program developed for the 1130 computer.

Hydrologic soil cover complex numbers show the effect that soil type, land use, and land treatment have on runoff. The watershed was divided into 23 areas to compute soil cover complex numbers. The runoff curve numbers under present conditions range from 78 to 80 with an average of 79 for the watershed. With land treatment measures applied, the runoff curve number ranges from 78 to 80 with the majority of the areas having a runoff curve number of 79; therefore, the average remains at 79 with land treatment applied. Land under adequate conservation treatment presently represents approximately 75 to 80 percent of the land; under project conditions this percent is expected to range from 80 to 90 percent. This reflects the reason for no significant change in runoff curve numbers.

Surface runoff is based upon procedures described in the SCS National Engineering Handbook, Section 4, Hydrology and Technical Release Number 20, Computer Program for Project Formulation, Hydrology.

Precipitation amounts used in flood analysis were based upon amounts as published in the United States Weather Bureau Technical Paper Number 40.

The relationship of precipitation and volume of runoff to discharge was developed by the method outlined in Technical Release Number 20, Computer Program for Project Formulation, Hydrology.

For flood frequency analysis in the Big Nemaha River Basin a modification to the standard Rainfall Table 1 distribution was made; Rainfall Table 2 as shown in TR20 with a 6-hour duration was used to develop the discharge-frequency analysis. This modification to the program was based on an analysis of four stream gages located in the basin. The TR20 program was used to

route the watersheds through the stream gages in the basin and from this it was determined that TR20 Rainfall Table 2 with a 6-hour duration produced the best results when compared with basin stream gage analysis. Modification to the peak discharges as computed by TR20 was made to correct for area rainfall distribution and basin stream gage analysis.

Downstream floodwater effects of Long Branch Watershed were computed using the TR20 computer program. The entire Big Nemaha River Basin has been prepared for TR20 computer analysis. The conditions used to determine downstream effects are the proposed structures in Long Branch Watershed, Upper Big Nemaha Watershed, Rock Creek Watershed, and Walnut Creek Watershed. Walnut Creek Watershed is a completed watershed while Upper Big Nemaha and Rock Creek Watersheds are authorized for construction and in various stages of completion.

For evaluation purposes, present conditions in the Big Nemaha River Basin are assumed to be all floodwater structures completed in the authorized watersheds of Upper Big Nemaha, Rock Creek, and Walnut Creek.

The city of Humboldt (population 1,194) is located in the watershed. The southwest portion of the city has sustained floodwater damages. Interviews were made in Humboldt to determine frequency and extent of damages that could be expected to occur. The most recent event of flood damage to Humboldt occurred in 1958. Highwater marks and rainfall data obtained on this storm combined with information from computed water surface profiles and the TR20 hydrology program, it was determined that the 1958 flood in Humboldt was in the magnitude of a 50-year event. It was further determined from urban survey of houses, that urban damages to buildings would begin with a 25-year storm event; however, the city park area and area to the west of town would experience overland flooding beginning with a 10-year frequency storm. With the planned project no urban damages would occur to existing buildings, although the future 100-year flood event would cause overland flow through the city park area and the area to the west of town.

The following conditions were evaluated:

1. Current watershed conditions.

2. Watershed conditions with project land treatment applied and floodwater retarding structures installed. Ten different structural systems were studied.

Structural storage requirements were based on the National Engineering Handbook, Section 4 (Hydrology) and Engineering Memorandum 27 criteria.

Floodwater retarding structure release rates were established considering downstream channel capacities and economics of floodwater storage. Individual structure release rates are shown in Table 3.

The multiple-purpose structure (Site 21) is located on Kirkham Creek which has a minimum computed base flow of 54 acre-feet per year.

A water budget was developed using a recreation pool of 159 acres, assuming no base flow; a seepage rate of 0.05 foot/month/surface acre; and an annual evaporation of 48.7 inches per year. The period analyzed was from 1955 to 1970. For this period the maximum drawdown due to evaporation and seepage was less than 2 feet from the recreation pool elevation, with the surface area being reduced to 147 acres. Water yield at this site is adequate under normal conditions to offset the seepage rate at this site, as determined from the SCS Soil Mechanics Laboratory's seepage analyses performed on undisturbed foundation samples collected during the geologic site investigation.

ENGINEERING INVESTIGATIONS

Topographic maps with 4-feet contour intervals were made for all sites. One site was field surveyed and all others were developed by kelsh plotter. All elevations are referenced to mean sea level datum. Stage storage and stage area data as well as embankment quantities were derived from the topographic maps.

Structure storage capacity was set to provide for the total 50-year calculated sediment accumulation plus the floodwater storage determined by hydrologic criteria.

Structure drainage areas were delineated and measured from USGS 7-1/2 minute quadrangle maps.

A cost estimate was prepared for each structure based on current bid prices. A 10 percent contingency was added to the engineering estimate to arrive at the cost shown on Table 2.

Foundation exploration was accomplished on three sites in the watershed and this data was used in design and cost considerations of the structures.

Land rights work maps have been prepared for all structures in accordance with the Watershed Protection Handbook and applicable Nebraska memorandums.

GEOLOGIC INVESTIGATIONS

Preliminary geologic investigations were made of all sites. Sufficient data was obtained to arrive at reasonable cost estimates for the structures involved. These investigations included studies of surface and subsurface geologic conditions of the foundation, principal and emergency spillways, borrow areas, and possible mineral resources associated with these areas of study.

Detailed site investigations for structures 2 and 71 were completed.

A truck mounted combination rig was used for the subsurface investigations. Detailed investigations included sufficient testholes to obtain proper geologic correlation of surface and subsurface materials at the dam proper. An extensive sampling (undisturbed) program of centerline materials subject to consolidation or collapse was completed. These undisturbed foundation samples

and disturbed borrow samples were submitted to the Soil Mechanics Laboratory for test results and design recommendations.

A partial site investigation of site 21 was completed. The primary purpose of this investigation was to determine foundation conditions and collect undisturbed samples for a Soil Mechanics Laboratory seepage analyses. Seepage analyses indicated that any seepage occurring at the site would be more than offset by the base flow in Kirkham Creek, thus, assuring that sufficient water is available to maintain the recreation pool at the design elevation.

Design of these structures was based on the results of these analyses.

Flood Plain Damages Investigations

Flood plain acres undergoing scour damages were relatively small when compared to total flood plain acres. Scour areas were mapped in the field from aerial photos. Percent of damage was related to depth of soil loss and its effect upon crop production. Depth of soil loss was determined by hand-auger holes in selected sample areas within the individual flood plain reaches.

Flood plain sediment damages were moderate in extent and restricted generally to near channel areas. Damages were assessed as a loss of production, in percent, as related to the depth of texture of the deposited sediments.

Sedimentation Investigations

Sediment rates were determined for all floodwater retarding structures. Rates were determined by calculating gross erosion under present conditions and incorporating expected changes in land use, land treatment, and pasture management to determine future rates.

Soil classifications, land slopes, length of slope, and present land use were taken from field observations and standard soil maps. Estimates of future land use and extent were based on soil capabilities. Land treatment, changed land use, and extent of local cooperation were determined by district supervisors and local SCS Field Office personnel.

Fifty-year sediment storage requirements for floodwater retarding structures were calculated by using a predictive equation in accordance with SCS Engineering Memoranda.

Erosion Investigations

Field observations, soil maps, and low level aerial photo interpretations were used in determining land use, soil types, slope lengths, channel erosion, critical erosion source areas, and other related erosion factors. These factors were then incorporated into the predictive equation to determine gross erosion within the watershed.

Gully erosion rates from critical sediment source areas were determined by determining the rate of gully advancement from local interviews, and from comparison of 1938 and 1966 aerial photos.

Channel bank erosion on the main channels and side tributaries was calculated from studies 1/ completed in the Platte River Basin Study.

A sediment delivery ratio is the percentage relationship between the sediment yield at a specified measuring point in a watershed and the gross erosion occurring in the watershed upstream from that point. Curves representing this relationship have been developed over the years for use in Nebraska for areas up to 400 square miles.

These curves were used to predict present and future sediment yields as related to gross erosion within the watershed.

The reduction in future sediment yields is realized as a benefit by a reduction in: sediment yields to the mouth of the watershed and downstream areas, deposition on flood plain croplands, deposition in and on roads and bridges, deposition on wildlife nesting and habitat areas, and an overall improvement in the quality of surface in the watershed.

Grade Stabilization Investigations

Land stabilization problem areas on critical sediment source areas were located and investigated by field examinations, by use of the stereoscope on low level aerial photos and by recommendations of local landowners and SCS Field Office personnel. Problem areas were surveyed and cost-benefit calculations made.

Physical damages under present conditions that would be avoided by project action were calculated based on past rate of gully growth. These past rates were determined by local interviews, comparison of old and new aerial photos and by natural records of growth. All problems within the watershed were investigated. Damages considered included those to land, state, and county roads, bridges; fences; farm crossings; and other related properties. Gully growth also results in changed land use due to inaccessibility or broken units leaving areas of land too small to economically crop. Areas of depreciation due to lack of stable outlets for land treatment were determined by the location of the present gully and its expected 50 year growth.

Downstream Sediment Damages

Total gross erosion from all sources in the watershed was determined under present and future conditions with and without the project. Erosion sources included upland sheet erosion, gully erosion, streambank erosion, and other related forms.

1/ Channel and Streambank Erosion Studies in the Platte Level 'B' Study, 1974. A joint study among the Soil Conservation Service, Corps of Engineers, and the Bureau of Reclamation.

Upland sheet erosion was calculated from predictive equations. Gully erosion was estimated from the projected voided areas measured in grade stabilization and channel investigations.

Future sediment yields within the watershed were determined from reductions brought about by land treatment measures, by storage in structural measures, and by gully and channel sediment held in place by grade stabilization structures.

Sediment delivery curves, discussed under Erosion Investigations, indicated that approximately 24 percent of the total gross erosion yield would reach the main channels in Long Branch Watershed. This sediment was stored in structures, where proposed, or continued downstream to the Nemaha River.

The delivery rate in the main channels or below proposed structures was determined to approximate 65 percent. This delivery rate was based on similar studies completed in the Nemaha Basin and is related to flooding frequency and/or percent flood plain receiving sediment damages.

A random sample of 87 planned P.L.-566 structures in Nebraska was analyzed by employing the "Use of Facilities" method of cost allocation. The cost of reservoir sediment storage approximated 7 cents per ton in this study.

This value of 7 cents per ton was used as a guide in calculating the monetary benefits to be realized from obtaining a reduction in sediment yield to the mouth of the watershed.

ECONOMIC INVESTIGATIONS AND ANALYSES

Determination of Flood Damages

Interviews with local farmers and Soil Conservation Service technicians familiar with the watershed were used to supplement the basic data used in the evaluation of agricultural damages. Economic Research Service 1973 crop yield projections and crop production cost estimates were used as base data. Current normalized prices were used in the economic evaluations.

The computer program called "Economics, Version 2 for the IBM 1130, Program date March 1968, Revised, May 1969", was used in evaluating floodwater damages to crops and pastures. Five synthetic storms (100-year, 10-year, 5-year, 2-year, and 1-year) and data from 22 field survey valley cross sections were used in the analysis.

Frequency discharge and discharge depth area inundated relationships were obtained from TR20 Project Formulation and Water Surface Profile computer analysis.

The crop damage rate was determined as the value of reduced crop yield and adjusted to allow for any increase or decrease of production expenses. These damage rates were computed for various depths of inundation by months,

then weighted by the percent of seasonal distribution of floods for each month.

These factors are combined in the program to obtain the expected floodwater damages for the evaluation period.

Determination of Gully Damages

Grade stabilization problems were investigated. A determination was made of the rate of gully growth or voiding of land. It was assumed that land once voided would lose its value and thus constitute damage. In addition, the effects of land above an unstable grade were evaluated. The differences in net incomes that could be realized if the land were utilized in its "highest and best use" with project versus its "highest and best use" without project were identified as damages.

Determination of Other Agricultural Damages

Other agricultural damage (such as floodwater damages to fences, farm buildings, livestock, and clean up of debris) was determined from an analysis of damage schedules furnished by the original Long Branch Conservancy District. About 10 percent of these schedules were checked for reliability. These other agricultural damages were estimated to be 10 percent of crop and pasture damage.

Determination of Road and Bridge Damages

Data used in the evaluation of roads and bridges was obtained from county and road officials and by direct appraisal. Present values of existing bridges were based on the estimated replacement values of bridges depreciated in accordance with present conditions of bridges. The percentage of damage was determined by stage and then converted by formula to dollar damage per storm or stage of inundation. Average annual bridge damages were then computed by weighing stage frequencies by storm frequencies. Only those bridges across Kirkham and Long Branch Creeks were evaluated.

Damage to roads was estimated to be 5 percent of the bridge damage.

The estimated monetary value of the physical damage to the flood plain from erosion was based on the value of the production lost, taking into account the lag in recovery of productivity and the cost of farm operation to speed recovery. Damage was related to depth and area of flooding with weight given to increased velocity from deeper flows.

Indirect damages were estimated at 10 percent of the agricultural damage and 15 percent of the nonagricultural damages.

Determination of Downstream Benefits

The Long Branch Watershed is one of several watersheds which contribute to the flooding of the two lower reaches of the Big Nemaha subbasin of the Nemaha Basin. The flood damage reduction allocated to the Long Branch

Watershed project is about 17 percent of the total present flood damage in the lower two reaches. The total direct damage reduction for Long Branch Watershed includes about 90 percent crop and pasture, 5 percent road and bridge, and 5 percent other agricultural damage reductions. The total downstream benefits include direct, indirect, and sediment damage reductions.

Benefits from Reduction of Damages

Average annual damages were calculated for conditions without a project, with land treatment installed and after installation of the complete project. The difference between damages at the time of initiation of each project increment and that expected after its installation constitutes the damage reduction benefits brought about by that increment.

Benefits from reduction from urban, crop, pasture, other agricultural, sediment, scour, road, bridge, downstream, and deposition damages result from the reduction in areas inundated, reduced depths of inundation, reduced gross erosion, and the trapping of sediment in sediment pools.

Determination of Recreation Benefits

There are deficiencies of land and waterbased recreation in the Beatrice Socioeconomic area (Thayer, Jefferson, Gage, Pawnee, and Richardson Counties). 1/ It is estimated that planned recreation facilities at site 21 could provide 480 recreation opportunities per day. The facilities will be used primarily from Memorial Day to Labor Day with 10 percent of additional activities during the "off season". A value of $2.25 for each of 25,200 recreation visits was used in the computations of recreational benefits.

Determination of Urban Damages

The lower reach of Long Branch Creek passes through the western portion of Humboldt, Nebraska. Some 42 business and residential sites were investigated relative to flood damages. It was determined that no flood damage occurs at 10-year frequency storms. At the 25-year frequency storms two basements would be flooded at $315 damage. At the 50-year frequency storm nine additional sites and the city park would bring the total damage to $5,480. At the 100-year frequency storm five additional sites will sustain damage making a total damage of $9,850. Considering the frequency of the estimated damages, the average annual damages are $380 all of which will be eliminated by the project.

Redevelopment Benefits

Redevelopment benefits were limited to semiskilled labor to be employed in the construction and in the operation and maintenance (at a declining rate for 20 years) of structural works of improvement. It was assumed that the bulk of the semiskilled labor required would be furnished by local labor. Conservation contractors and Soil Conservation Service engineers estimated

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1/ "Comprehensive Plan for Outdoor Recreation" (1968).

the amounts of semiskilled labor that would be employed in construction of structural works of improvement. Operation and maintenance records of watersheds in operation were utilized in making estimates of semiskilled labor employed in the operation and the maintenance of structural works of improvement.

Determination of Secondary Benefits

The value of local secondary benefits stemming from the project was considered to be 10 percent of the direct primary benefits (less gully benefit) plus 10 percent of the operational and maintenance cost. These benefits which accrue within the immediate zone of influence of the project are from the transporting, processing, and marketing of those goods and services that produce the primary structural benefits. No induced secondary benefits were claimed.

Appraisal of Land and Easement Values

Cost per acre of land, easements, and rights-of-way reflects the sponsor's estimates. Landlord's net return was analyzed and the resulting value was capitalized. Records showing recent land sales were also studied. These compared favorably to the sponsor's estimate. Cost per acre of areas encroached on by structure sites and sediment pools and areas to be acquired for recreational development was considered to be 100 percent of the estimated market value. Cost of necessary easements for flood storage was considered to be 25 percent of the estimated market value of the land.

Operation and Maintenance

The Operation, Maintenance, and Repair (OM&R) cost is the estimated value of materials, equipment, services, and facilities needed to operate a project, keeping it in sound operating condition during the evaluated life of the project. The factor used to estimate the OM&R necessary for structural measures was derived from studies of projects completed in the past. The factor used to estimate OM&R costs for recreational facilities is based on the recreation visits to be provided.

Operation and maintenance costs for structures were estimated at .38 percent of construction cost. Operation, maintenance, and replacement costs for recreational facilities were estimated at $.25 per recreation visit to be provided. Operation and maintenance cost estimates for the wildlife habitat plantings were provided by the U. S. Fish and Wildlife Service.

Details of Methodology

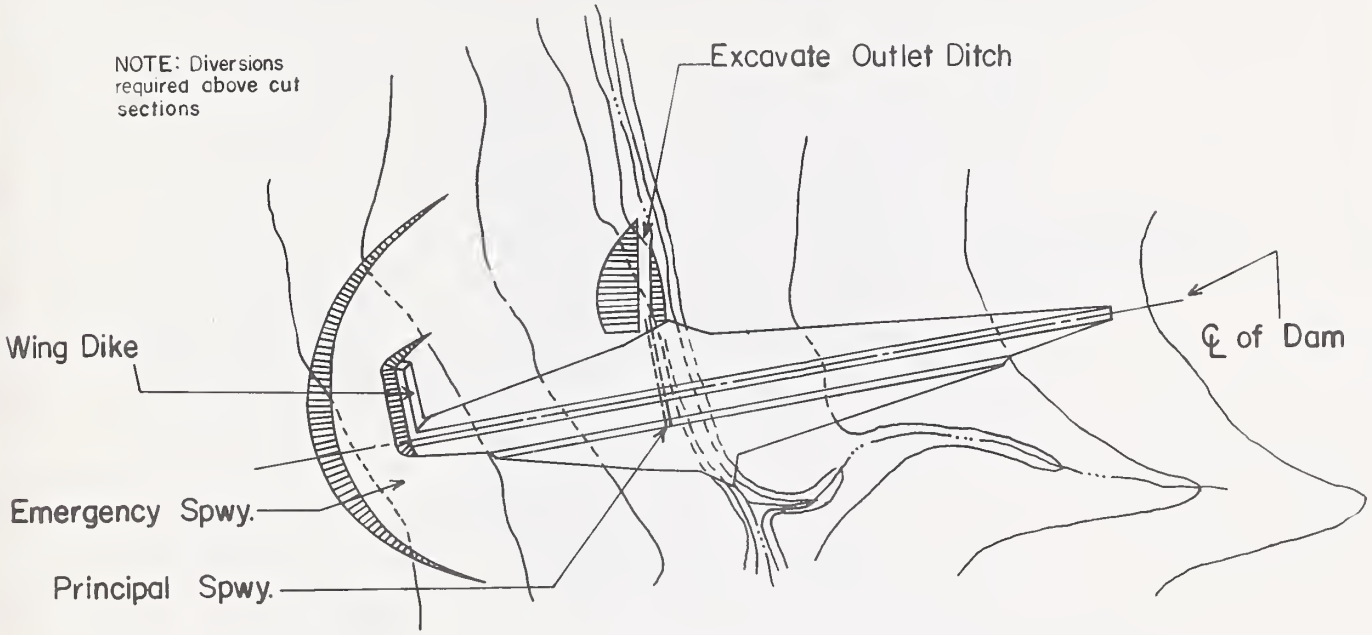
Details of the procedures used in the evaluation are described in the Soil Conservation Service Economics Guide for Watershed Protection and Flood Prevention, March 1964.

Price Base

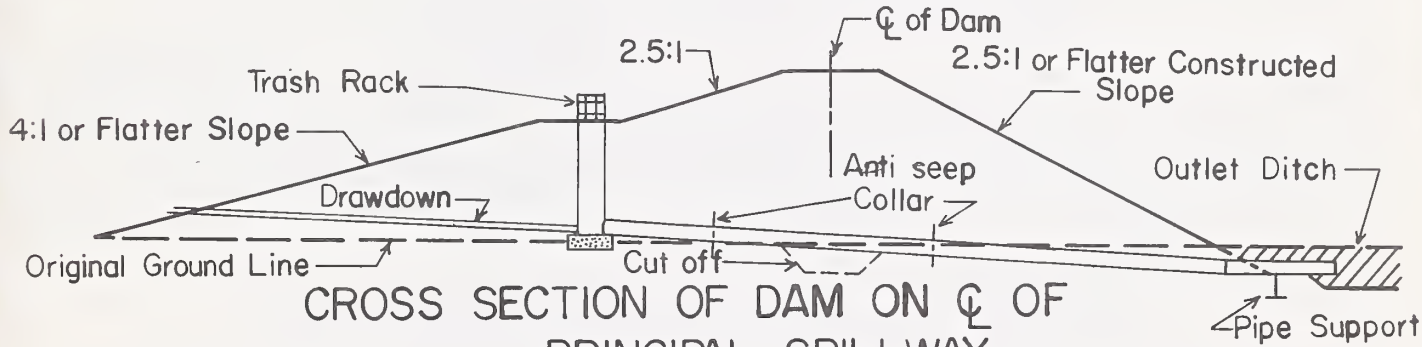
Current normalized prices, as published by the Watershed Resources Council (October 1974), were used for benefit determinations.

Cost of land treatment measures, technical assistance, and structural works of improvement are estimated at 1975 price levels. Installation costs were amortized at 5-7/8 percent interest for 50 years.

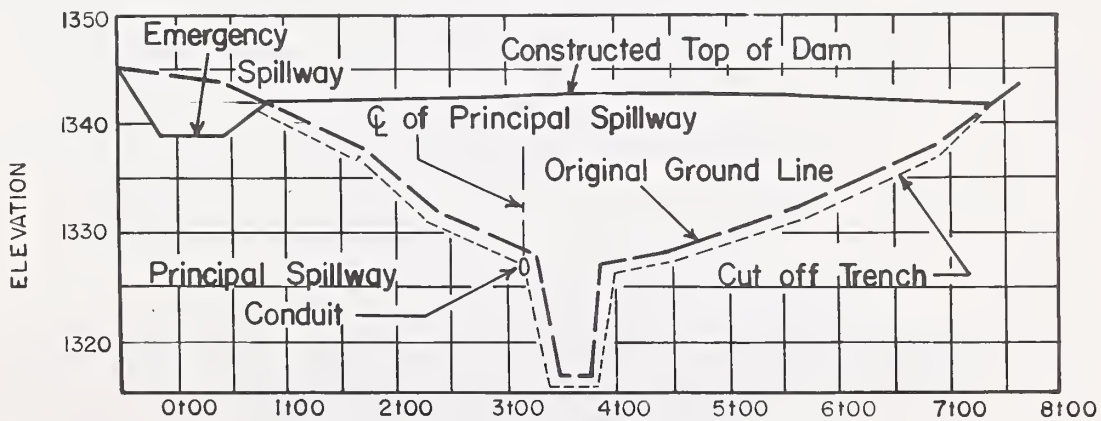
TYPICAL STABILIZING AND SEDIMENT CONTROL STR.



GENERAL PLAN



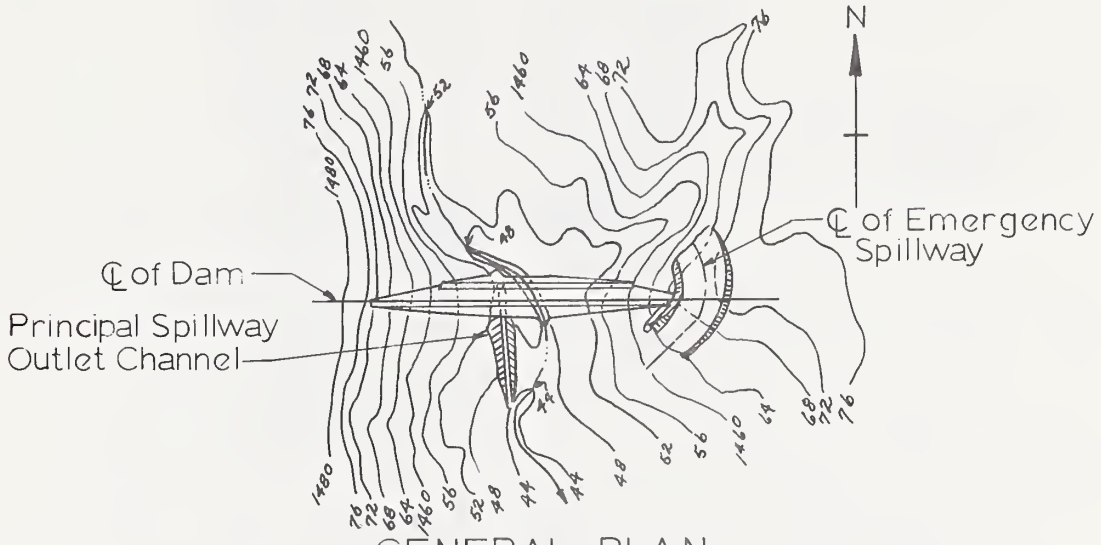
CROSS SECTION OF DAM ON ℄ OF PRINCIPAL SPILLWAY



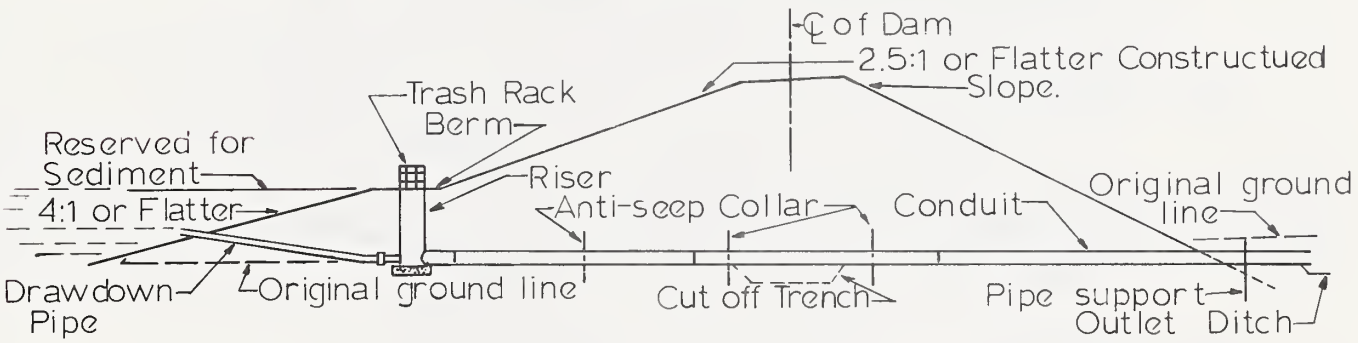
PROFILE ON ℄ OF DAM

Figure 1

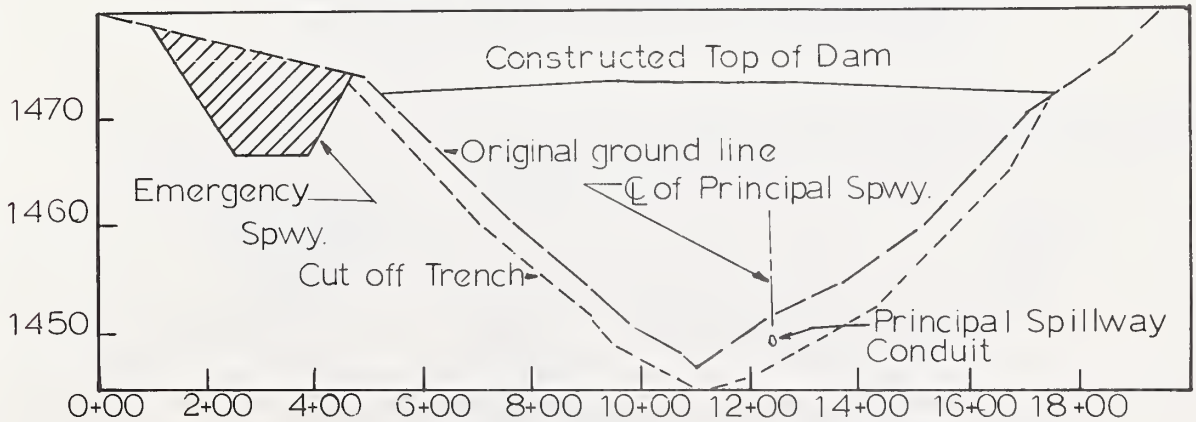
TYPICAL FLOODWATER RETARDING STRUCTURE WITH SINGLE STAGE PRINCIPAL SPILLWAY



GENERAL PLAN



CROSS SECTION OF DAM ON CENTERLINE OF SINGLE STAGE PRINCIPAL SPILLWAY



PROFILE ON ℄ OF DAM

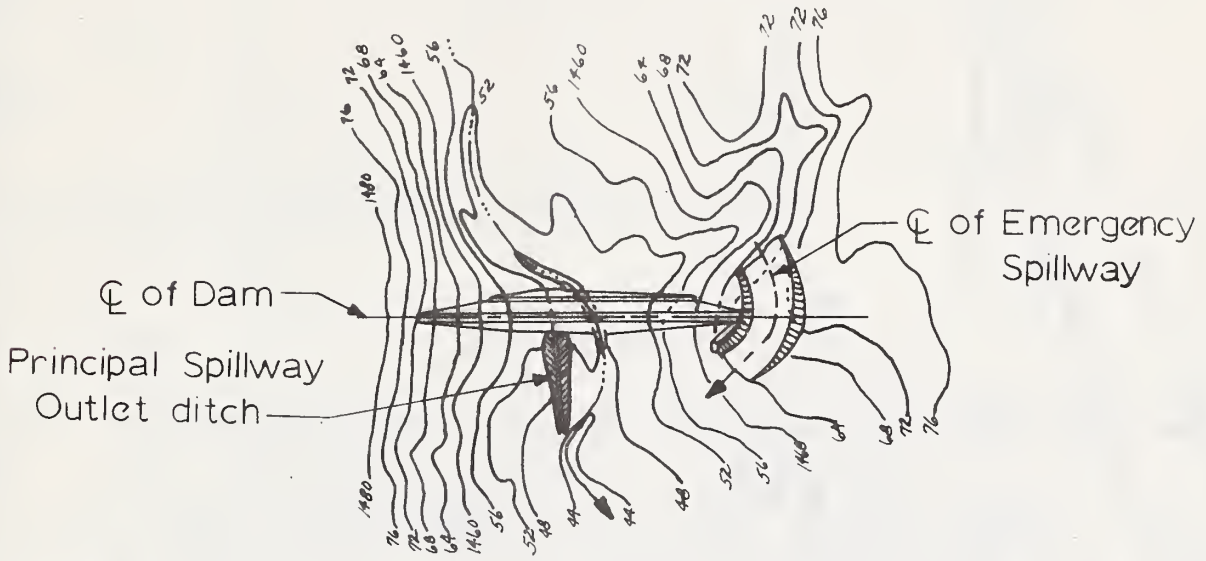
SOURCE:
NEBRASKA S.O.

USDA-SCS-LINCOLN, NEBR. 1972

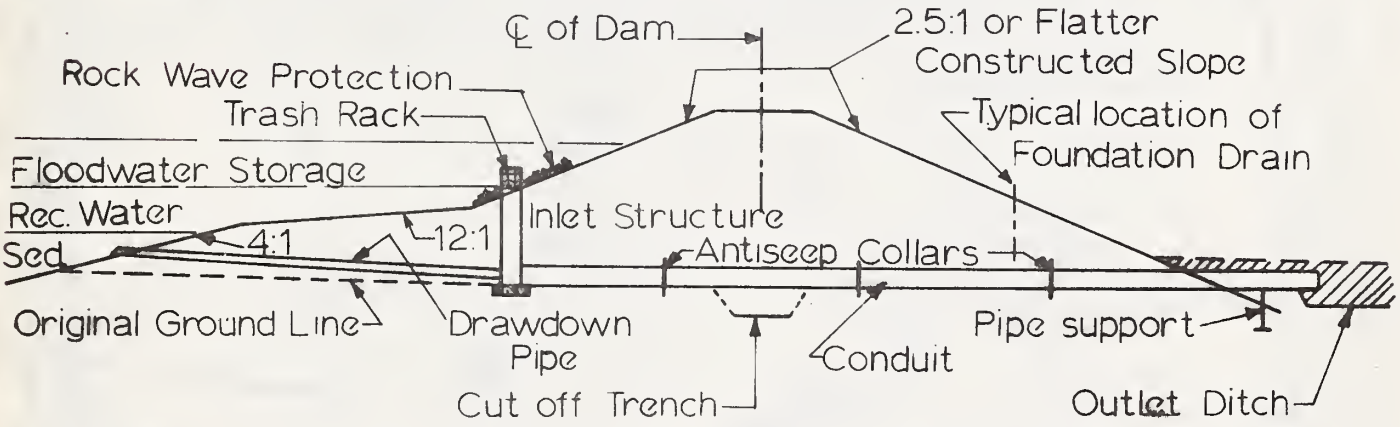
6-9-72
5,L-30448

Figure 2

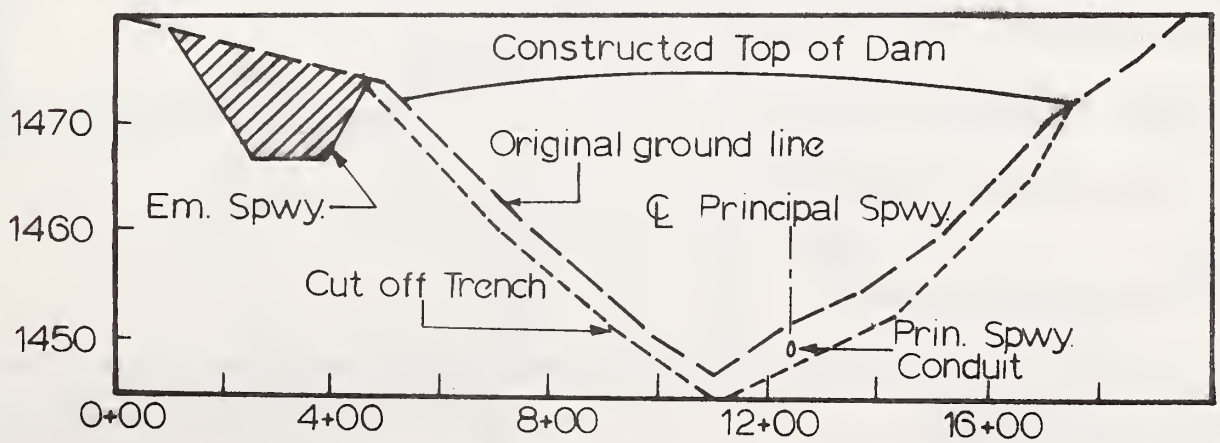
Typical Floodwater Retarding Structure With Recreational Storage



General Plan

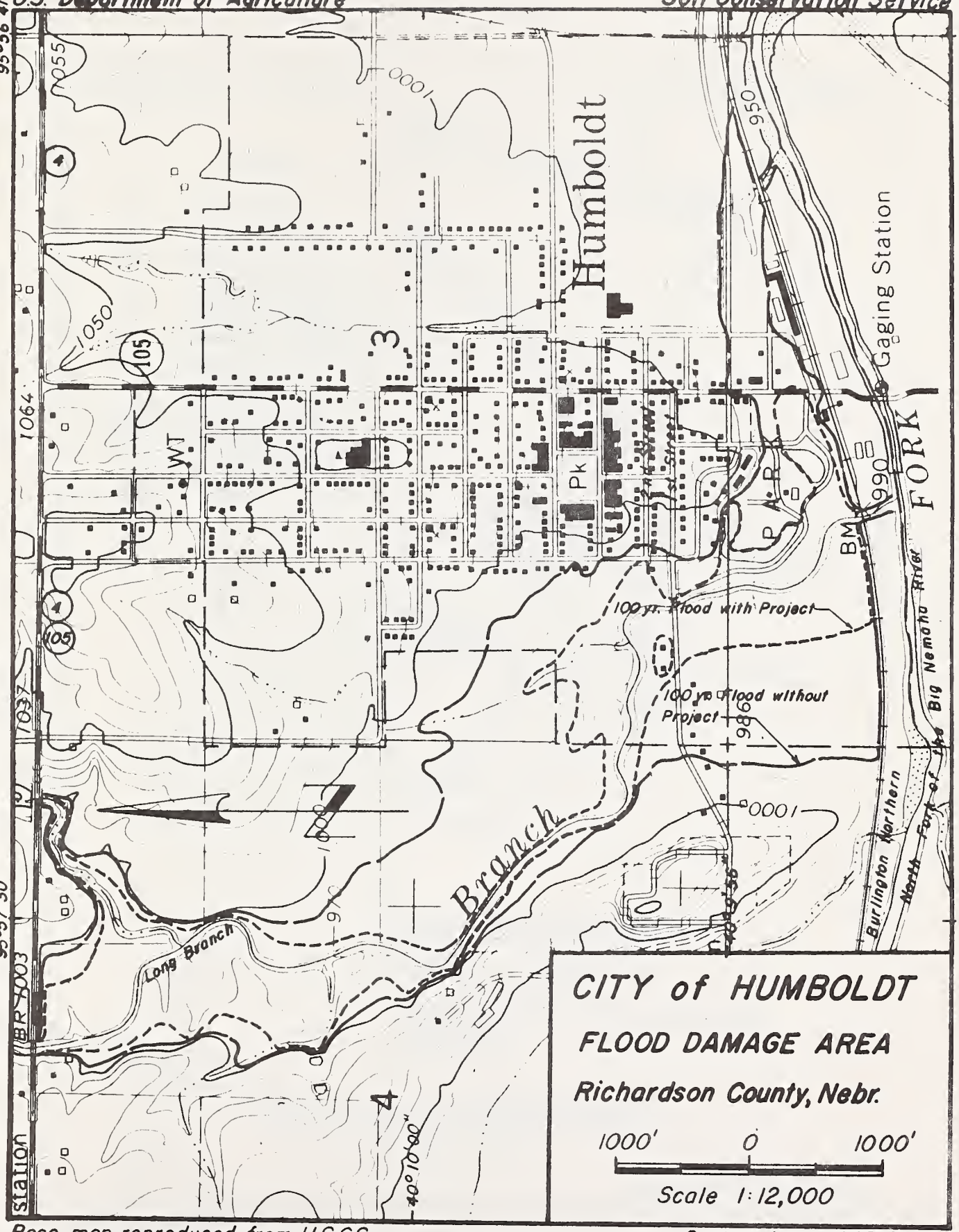


Cross Section of Dam on Centerline
Single Stage Principal Spillway



Profile on Centerline of Dam

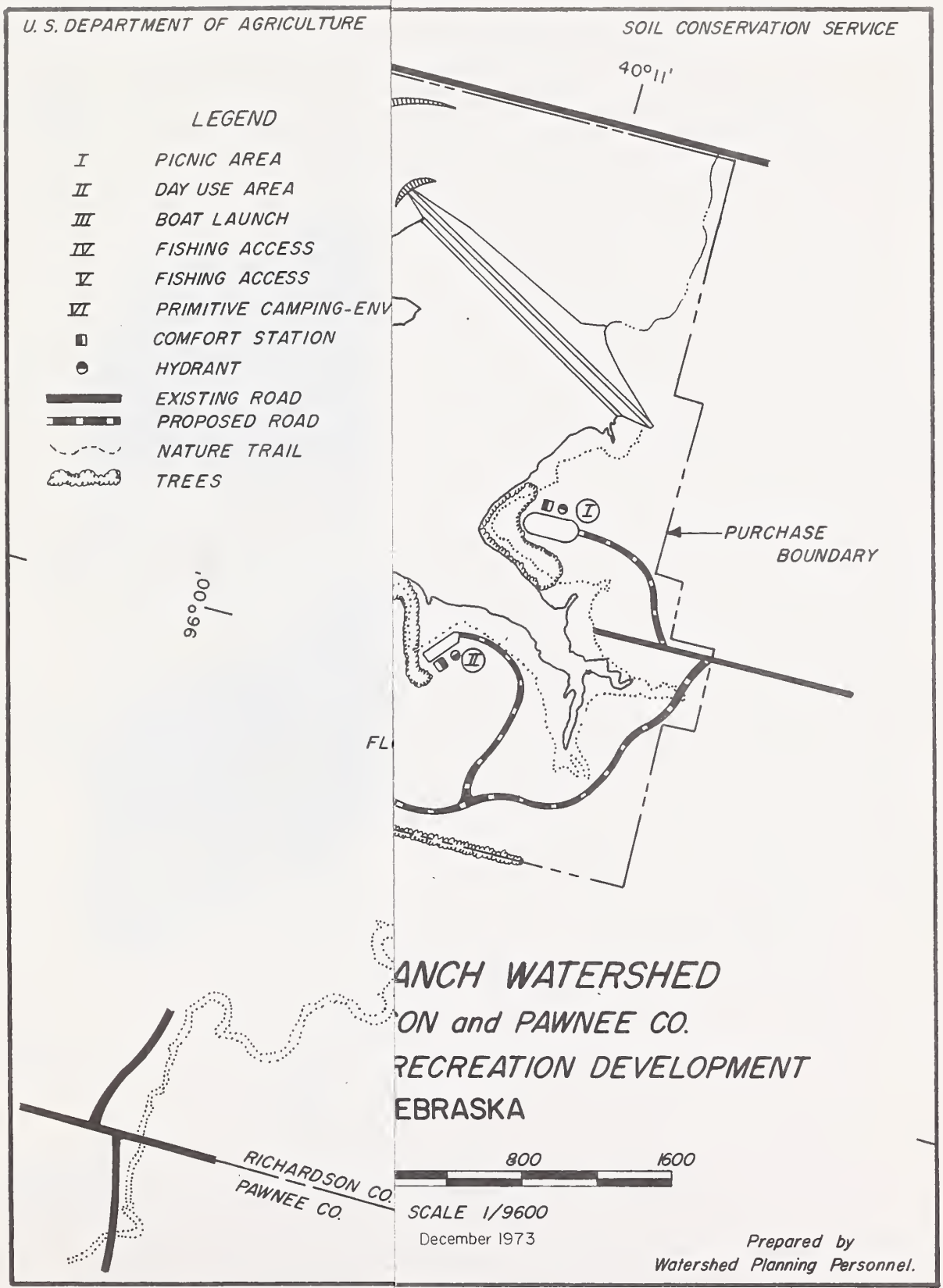
Figure 3



Base map reproduced from U.S.G.S.
7.5 minute Quadrangle - Humboldt, Nebr.
(1965) Polyconic Projection

Contour Interval 10 feet
Additional data furnished by
S.C.S. Field Technicians.

Figure 4



SOURCE: SCS Kelsh Survey.
USDA-SCS-LINCOLN, NEBR. 1973-SR

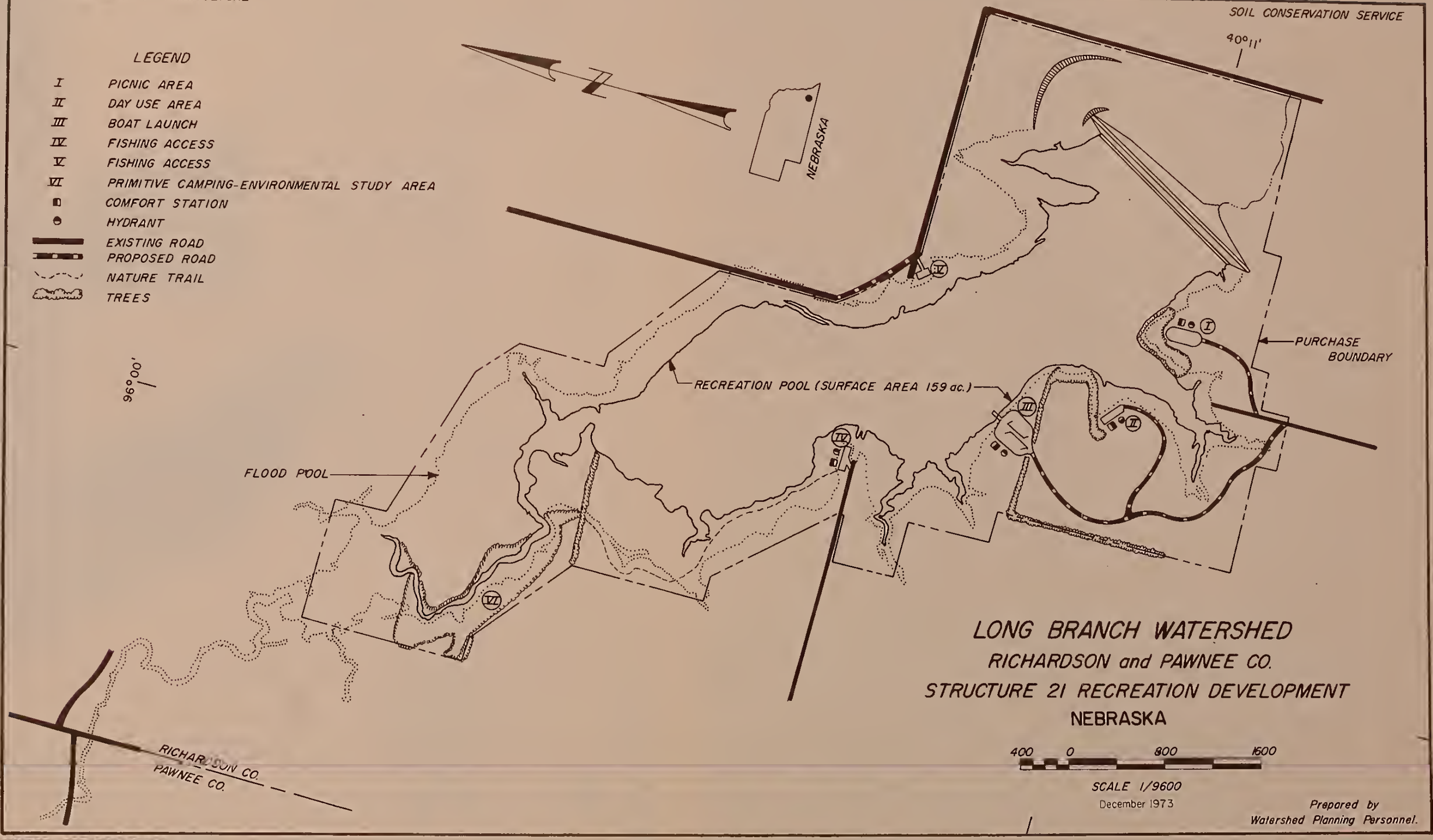
Figure 5

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

- I PICNIC AREA
- II DAY USE AREA
- III BOAT LAUNCH
- IV FISHING ACCESS
- V FISHING ACCESS
- VI PRIMITIVE CAMPING-ENVIRONMENTAL STUDY AREA
- COMFORT STATION
- HYDRANT
- EXISTING ROAD
- PROPOSED ROAD
- NATURE TRAIL
- TREES



LONG BRANCH WATERSHED

RICHARDSON and PAWNEE CO.

STRUCTURE 21 RECREATION DEVELOPMENT

NEBRASKA

400 0 800 1600

SCALE 1/9600

December 1973

Prepared by Watershed Planning Personnel.

SOURCE: SCS Kelsh Survey.
USDA-SCS-LINCOLN, NEBR. 1973-SR

Figure 5

PROJECT MAP

LONG BRANCH WATERSHED

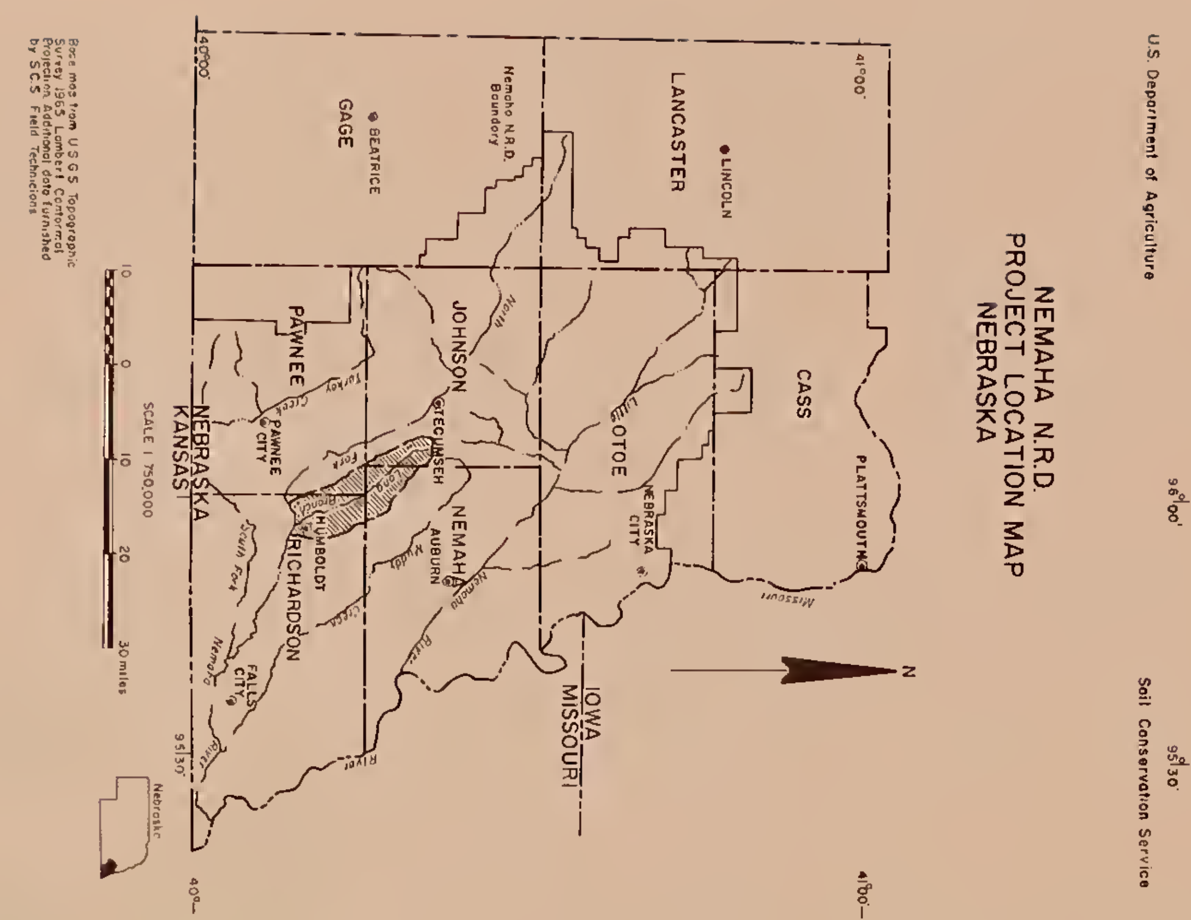
JOHNSON, NEMAHA, PAWNEE
AND RICHARDSON COUNTIES
NEBRASKA

Figure 6

SOURCE:
S. C. S. DRAWING NO. 5,R-25,334 AND INFORMATION
FURNISHED BY FIELD TECHNICIANS. POLYCONIC PROJECTION

USDA SCS-LINCOLN, NEBR. 1974

2-12-74
5,S-32,841


U.S. Department of Agriculture
Soil Conservation Service
NEMAHA N.R.D.
PROJECT LOCATION MAP
NEBRASKA
LANCASTER
LINCOLN
CASS
PLATTSMOUTH
GAGE
BEATRICE
JOHNSON
TECUMSEH
OTOE
NEBRASKA CITY
NEMAHA
AUBURN
PAWNEE
PAWNEE CITY
HUMBOLDT
RICHARDSON
FALLS CITY
IOWA
MISSOURI
NEBRASKA
KANSAS
Nemaha N.R.D. Boundary
SCALE 1:750,000
30 miles
Base map from U.S.G.S. Topographic Survey 1965 Lambert Conformal Projection. Additional data furnished by S.C.S. Field Technicians

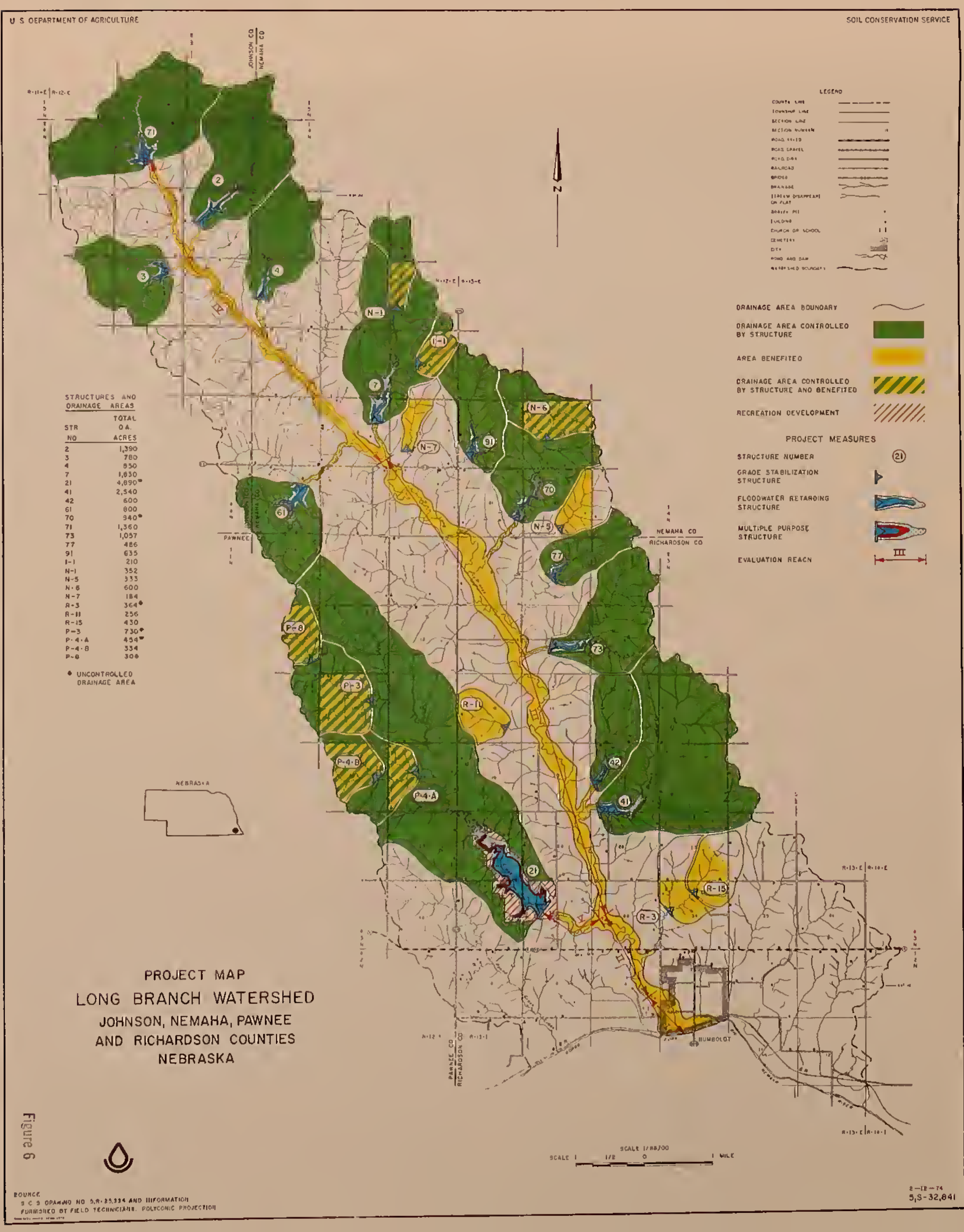

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LEGEND
DRAINAGE AREA BOUNDARY
DRAINAGE AREA CONTROLLED BY STRUCTURE
AREA BENEFITED
DRAINAGE AREA CONTROLLED BY STRUCTURE AND BENEFITED
RECREATION DEVELOPMENT
PROJECT MEASURES
STRUCTURE NUMBER
GRADE STABILIZATION STRUCTURE
FLOODWATER RETARDING STRUCTURE
MULTIPLE PURPOSE STRUCTURE
EVALUATION REACH
STRUCTURES AND DRAINAGE AREAS
STR NO | TOTAL D.A. ACRES
2 1,390
3 780
4 850
7 1,830
21 4,890•
41 2,540
42 600
61 800
70 940•
71 1,360
73 1,057
77 486
91 635
I-1 210
N-1 352
N-5 333
N-6 600
N-7 184
R-3 364•
R-11 256
R-15 430
P-3 730•
P-4-A 454•
P-4-B 334
P-8 306
• UNCONTROLLED DRAINAGE AREA
NEMAHA CO
RICHARDSON CO
HUMBOLDT
PROJECT MAP
LONG BRANCH WATERSHED
JOHNSON, NEMAHA, PAWNEE
AND RICHARDSON COUNTIES
NEBRASKA
SCALE 1/88,700
2-12-74
5,S-32,841

Figure 6